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Occasional Papers on the Kinds of Plants

By L. H. Bailey

1. The Arecastrums
2. The Butias

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1. QUEEN PALM IN NATURE, on a rocky foreland in southern Brazil.—*Arecastrum Romanzoffianum.*

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10-12-36

ARTICLE 1. ARECASTRUM.—THE QUEEN PALMS.

In 1860 William Jackson Hooker described and figured in Botanical Magazine a handsome palm that he named *Cocos plumosa.* The designation "plumosa," which means feathered or plumose, was bestowed as characteristic "of the beautiful and elegant branches of the panicle." It had been "long cultivated at Kew" under glass and it bore "blossoms in the summer and autumn of 1859, probably for the first time in Europe." It had been received "many years ago" from Loddiges, British nurseryman, "as a Brazilian species." Under the name *Cocos plumosa,* "this truly noble palm," as Hooker designates it, is much planted and widely distributed over the world.

Hooker was unaware that his palm had been described and figured thirty-eight years earlier as *Cocos Romanzoffiana* by the poet-botanist Louis Charles Adelbert von Chamisso in the work Picturesque Voyage written by Louis Choris who was artist of a memorable journey. Chamisso and Choris were members of the Otto von Kotzebue Russian expedition around the world that was fitted out by Count Nikolai Petrovitch Romanzoff to visit far away lands and to explore the Bering Sea. In the party also were Eschscholtz as physician, and Wormskiold the Dane who contributed his knowledge of travel and natural history. Choris introduces his book with a portrait of Count Romanzoff.

The palm was discovered on the island of Santa Catharina, southern Brazil, in December 1815. The expedition sailed from Kronstadt, Russia, on July 30th of that year, reached Chile in February 1816 and San Francisco in October 1816. It came to an end on August 3rd, 1818, when the two-masted brig Rurik anchored in the Neva at St. Petersburg, in front of Count Romanzoff's palace.

As *Romanzoffiana* is the earliest known specific name, it must follow the palm in whatever genus it may be placed. In the correspondence section of Flora oder Botanische Zeitung published at Regensburg in 1823, review is made of the botanical part of Choris' book and *Cocos Romanzoffiana* is described. Under this name the tree also appears in 1826 in the great work then publishing in Munich by Carl Friedrich Phillip von Martius, botanist and ethnologist and the first great student of the palms.

In the course of time this palm and its relatives became better known, and more preserved material accumulated in the museums. It was then evident that the genus Cocos of Linnæus had received accessions that really do not belong there. It remained for the late Odoardo Beccari, Italian student of the palms, in 1916 to break up the genus Cocos as there-

tofore understood, and the *Cocos plumosa* of Hooker was placed in a new genus, Arecastrum.

The substantive name Arecastrum did not originate with Beccari, however. It started with Oscar Drude in the palms of Flora Brasiliensis, 1882, but only for a section of the genus Cocos, and therefore with no change in nomenclature. Drude made the name to express similarity to the Old World genus Areca in the arrangement of the flowers on the rachilla. In his study of the genus Cocos which began publication in 1886 in Malpighia, Beccari raised the name to the status of a subgenus, with emended definition, still without involving nomenclature; and in his final paper on the subject in 1916 he separated it as a distinct genus, and this disposition is now accepted by botanists. The tree is worthy in decorative value of the attention that has been given to it, as the frontispiece testifies.

Under the Beccarian segregations (beginning in 1886), seven genera now represent the genus we had known as Cocos. Two other genera are included in the tribe by Beccari but they have not been known as species of Cocos. One of these is Jubæa of Chile, planted in California, and Jubæopsis of South Africa, apparently not yet established in the United States although seed has been introduced.

It is surprising that the segregations from Cocos were not made long ago rather than as late as 1916, as Areca, Corypha and other genera had been redefined in much earlier time. The old group was heterogeneous, comprising discordant elements. In this modern treatment, the genus Cocos comes back to its Linnæan status, comprising only the coconut, *Cocos nucifera*. The other true cocoids are western hemisphere palms, comprising the genera Arecastrum (the old *Cocos plumosa*), Syagrus, Butia, Barbosa, Rhyticocos (the former *Cocos amara*), Arikuryroba.

The coconut is outstanding because of its singular habit, large globose rather than small ovoid or conic pistillate flowers, imbricate and not valvate petals, very large outer spathe, and massive fruit in thick fibrose husk containing a content of liquid (milk). Of the remaining six, Barbosa, Rhyticocos, Arikuryroba bear a seed with ruminate albumen and the spathe is prominently furrowed or sulcate on the outside. The other three, Arecastrum, Syagrus, Butia, yield seeds with plain albumen. Of these, Arecastrum and Syagrus have a sulcate spathe, but the petiole is spineless whereas the petiole of Butia bears strong prominent spine-like processes (Fig. 4). Aside from the single species of Arikuryroba (the old *Cocos schizophylla*) Butia is the only one with spiny petioles.

Of the Cocos segregates, the queen palm, *Arecastrum Romanzoffianum* with several varieties held to comprise a single species, is much planted in the tropics and warm parts of the United States. Rhyticocos, with its single species of the West Indies, is little seen in general cultivation, and

the one Barbosa not at all. There are many species of Syagrus but only *S. Weddelliana* (*Cocos Weddelliana*) is much known to American horticulturists and that in the North as a pot plant for table decoration. The arikury palm, *Arikuryroba schizophylla*, the only species in the genus, is somewhat planted in Florida; it is discussed and pictured by myself in 1930 in Gentes Herbarum, ii, 195-199. The Butias comprise a distinct and attractive genus, some of which are widely planted in the United States and elsewhere: they are separately treated in the present Fascicle.

The present account of Arecastrum follows closely the successful treatment of Beccari in his completed monograph of the Cocos tribes in volume x of L'Agricoltura Coloniale, published in Italy in 1916. This paper was issued also as a reprint, with new paging, under the superscription Biblioteca Agraria Coloniale. His contributions are the foundation for modern work in this complex group of palms.

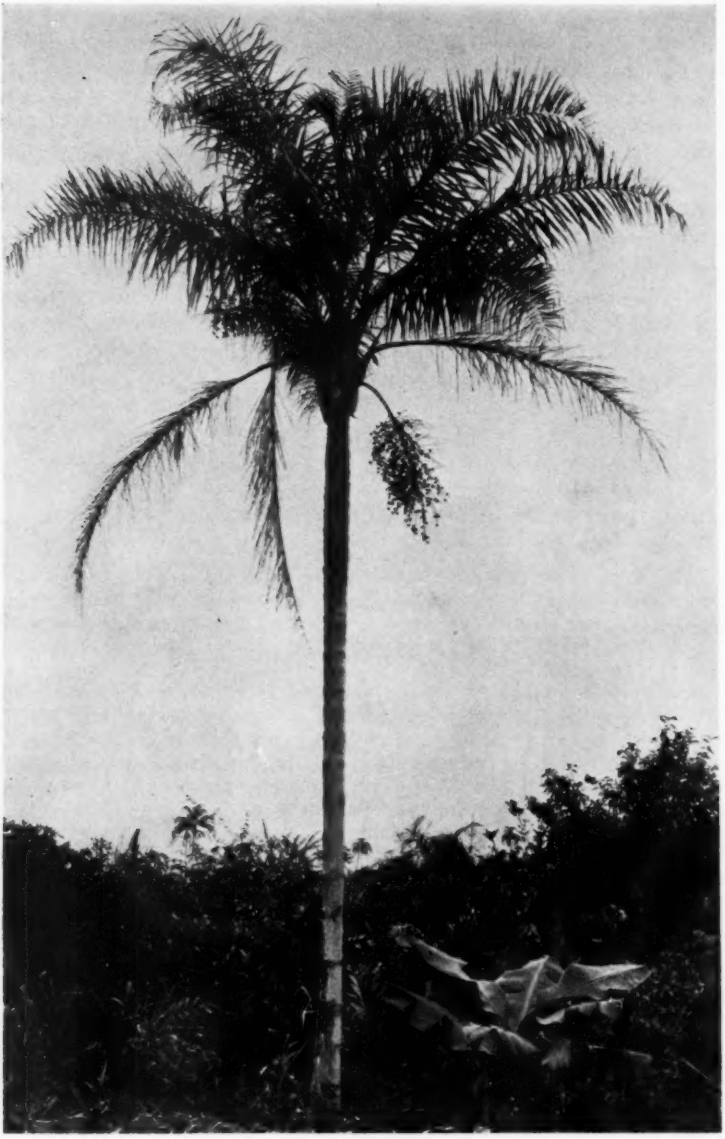
ARECASTRUM, Becc. in Agric. Coloniale, x, 446 (Florence, 1916); reprint, p. 14. QUEEN PALMS.

Cocos sect. iv *Arecastrum*, Drude, in Martius, Fl. Bras. iii, II, 402 (1882).

Cocos subgen. *Arecastrum*, Becc. in Malpighia, i, 351, 1888-89 (1886, apud Beccari).

Monœcious single-trunk pinnate-leaved palms with foliage soon shedding and leaving a naked ringed bole of nearly or quite uniform thickness, the internodes distinct: head or coma a wide-spreading canopy of long gracefully outcurving leaves bearing many narrow pinnæ, petioles much expanded and overlapping at the erect base, the margins shaggy but not spinose: inflorescence interfoliar, the long-cylindrical or spindle-shaped woody spathe (the major sheath) deeply sulcate on the outside: spadix long-peduncled and declined or hanging in fruit, the rachis equalling or exceeding the peduncle and bearing many simple lateral rachillæ: flowers borne in the bends of sinuous rachillæ, two staminates and one pistillate usually at each insertion in the main part but the upper end of the rachilla bearing only staminate flowers and the lower part largely pistillate; staminate flowers angular, lanceolate-pointed in bud and 8 mm. or more long, the 3 sepals minute, 3 petals narrow and prominent and lacking conspicuous nerves, stamens 6 with narrow anthers exceeding the filaments; pistillate flowers broad-conic, 5 mm. or more long and about as thick, the 6 floral envelopes tightly envolving the single tomentose 3-celled pistil, stigmas 3: fruit a dryish or somewhat succulent drupe containing a single hard nutlet commonly 1-seeded by abortion; albumen homogeneous but deeply invaded on one or two sides by vitreous projection from the wall making a strongly curved or irregular seed, with 3 micropylar pits near the base or below the middle; base of fruit sitting in a mostly shallow cupule formed by the somewhat accrescent floral envelopes.

Native in various habitats from central Brazil to Paraguay, Uruguay and northern Argentina. A variable series of palms, and adapted to many conditions in cultivation. The forms are abundantly planted in Florida



2. NATIVE ARECASTRUM in a swamp in southern Brazil, with scant open head or crown.

3. QUEEN PALM IN CULTIVATION.—*Arecastrum Romanzoffianum*, in Jamaica, with heavy full head.

and southern California and in intermediate points. Beccari concludes there is only a single species, and ranges the main forms in four to six botanical varieties, differing mostly in size and shape of fruit. Excluding var. *ensifolium* (which I have not seen), in which the character lies largely in the tomentum and very broad pinnæ, the varieties fall into three groups: (1) mature fresh fruit broad-ovoid to short-pyriform, 25 mm. (1 inch) or less long, *A. Romanzoffianum;* (2) fruit elliptic or narrow-oblong and not much if any exceeding 30 mm. long, var. *australe;* (3) fruit large and thick, to 35 mm. (about 1½ inches) or more long, var. *botryophorum.*

From the genus Butia the Arecastrums are distinguished by the taller stature at comparable ages, the annular or ringed rapidly defoliating trunk, green leaves with soft or flexile pinnæ, spineless petiole, major spathe prominently many-furrowed lengthwise, tomentose ovary, usually 1-celled nut with very irregular seed, cupule not greatly developed.

As in Butia, so in Arecastrum the shape and size of fruit, and consequently of seeds, appear to run all the way from one extreme to the other, and these variations are apparently not always associated with other characters of the tree. Beccari is apparently correct in concluding that all the forms are variants within a single species. The confusion in names among growers is undoubtedly due in part also to admixture of seeds.

It may be noted that Beccari did not formally establish a binominal for typical queen palms. He covered the species with a trinominal, *Arecastrum Romanzoffianum* var. *genuinum.* He did not adopt a similar course with the synspecies *Butia capitata,* and I have therefore harmonized the treatment of the two polymorphous species in this article; and, moreover, I adhere to the historic English and American practice of typifying a variable species under a binomial nomenclature.

Arecastrum Romanzoffianum, Becc. in Agric. Coloniale, x, 451 (1916); reprint p. 19. Figs. 1, 2, 3, 6, 7.

Cocos Romanzoffiana, Chamisso, in Voyage pittoresque autour du monde, sometimes quoted as Choris, in the part Traversée de Cronstadt au Chile, 5, tt.v,vi (Paris, 1822).

Cocos plumosa, Hooker, in Bot. Mag. t. 5180 (1860).

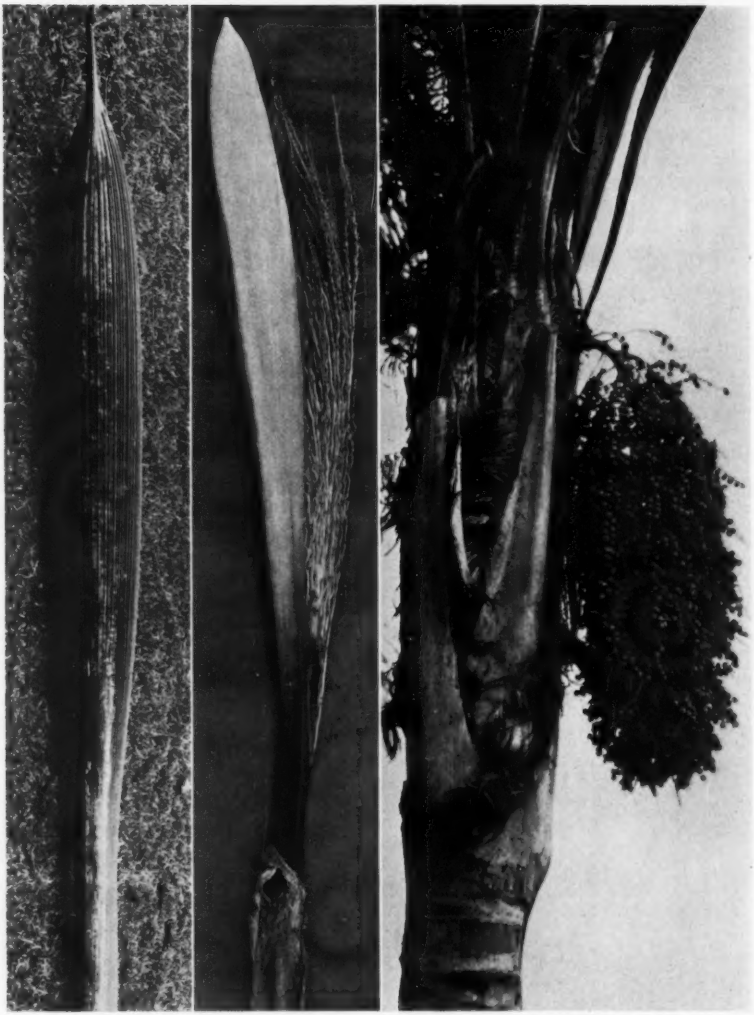
Cocos Romanzoffiana var. *plumosa,* Berger, in Hortus Mortolensis 87 (1912).

Arecastrum Romanzoffianum var. *genuinum,* Becc. in Agric. Coloniale, x, 455 (1916), reprint, p. 23; subvar. *minus,* l.c. 456, reprint, p. 24.

Rapid-growing relatively slender tree with gray ridge-ringed trunk to 13 m. tall, bearing a wide-spreading crown or head of 16-40 or even more long arching or drooping bright green graceful slender leaves and frequently with a few (or only 1) hanging dead leaves: petiole much expanded at base (Fig. 5, right) and set in a mass of fibers, more or less 1 m. long, with

variously ragged or shreddy margins, deeply concave above and convex beneath: blade 2-4 m. long, bearing very many narrow strongly midribbed glabrous pinnæ to 1 m. long and 3 cm. or less broad and that bend abruptly downward at about the middle and give the palm a characteristic appearance (showing well in Figs. 1 and 3 and also in the original portrait of the tree in Choris's Voyage), placed on the rachis singly or in groups of 5 or fewer: spathes arising from the lower axils, the major part to 1 m. or more long, pointed, strongly sulcate: spadix to 1 m. and more, pendent in fruit: staminate flowers mostly 8-10 mm. long, pistillate about one-half as much: fruit yellow, with a fleshy-fibrous exterior pulp, broadly ovoid to somewhat obovoid, in typical forms about 25 mm. (1 inch) long when dry but varying into smaller sizes, and usually not much exceeding 20 mm. in diameter; nutlet markedly broad, not attenuate at either end.

4. Petioles of Arecastrum and Butia.—Upper two, *Arecastrum Romanzoffianum;* lower two, *Butia capitata,* with spines.



5. ARECASTRUM, BUTIA, ARECASTRUM.—Left, spathe of *A. Romanzoffianum*, showing the ridges and grooves (surface sulcate). Middle, spathe of *B. capitata*, the surface smooth, with primary spathe at base. Right, fruit-cluster of *A. Romanzoffianum* in southern California.

On certain of the distribution and uses of *Arecastrum Romanzoffianum* Dr. P. H. Rolfs writes me as follows: "We encountered this palm at Paranaguá on the coast of Paraná [Brazil]. It was a predominating palm species there. We continued to see it on the plateau but less frequently. All the way down the Paraná River, beginning at Guayra, it was prominent. Throughout Uruguay, Paraguay and northern Argentina we met it rather constantly. In Argentina we went as far west as Tucuman, where it was the common species. It disappeared entirely as a native plant while we were going across the Chaco on the way to Tucuman.

"It appears to transplant as easily as does the palmetto in Florida. In Curityba, Tucuman, Buenos Aires, and Montevideo large trees had been transplanted from the forest to praças and gardens.

"In Rio Grande do Sul [Brazil] it is frequently employed as a forage for cattle in times of stress. We were told that the leaves of groves they showed us had been cut off as forage for cows. In the back country where the plants are much more abundant, the trees are frequently cut down so that the cattle can feed on the leaves."

A. Romanzoffianum var. **ensifolium,** Becc. in Agric. Coloniale, x, 459 (1916); reprint, p. 27.

Cocos botryophora var. *ensifolia*, Drude, in Martius, Fl. Bras. iii, II, 409 (1882).

Differs from *A. Romanzoffianum* in having the petiole and leaf rachis densely white-tomentose, segments larger with width to more than 4 cm., strongly sinuose rachillæ of spadix, and larger flowers: fruit not described.

State of Bahia in Brazil, in virgin forests. Not known to be in cultivation unless in tropical botanic gardens.

A. Romanzoffianum var. **australe,** Becc. in Agric. Coloniale, x, 459 (1916); reprint, p. 27. Fig. 7, nos. 7 and 8; also Fig. 7A.

Cocos australis, Martius, in Palmetum Orbignianum, 95, t. 1 fig. 2. t. 30c (1847): Hist. Nat. Palm. ii, 289 (1845).

Cocos Datil, Griseb. & Drude, in Grisebach, Symb. ad floram argentinam, 283 (1879), apud Becc.

Cocos acrocomioides, Drude, in Martius, Fl. Bras. iii, II, 409, t, 87 fig. 3 (1882), apud Becc.

Cocos Arechavaletana, Barb.-Rodr. in Contrib. Jard. Bot. Rio, ii, 43, and Sert. Palm. Bras. i, 108 (1903), at least mostly, apud Becc.

Cocos Romanzoffianum var. *Micropindo*, Becc. l.c. 462, t. iii fig. 1 (1916); reprint, p. 30.

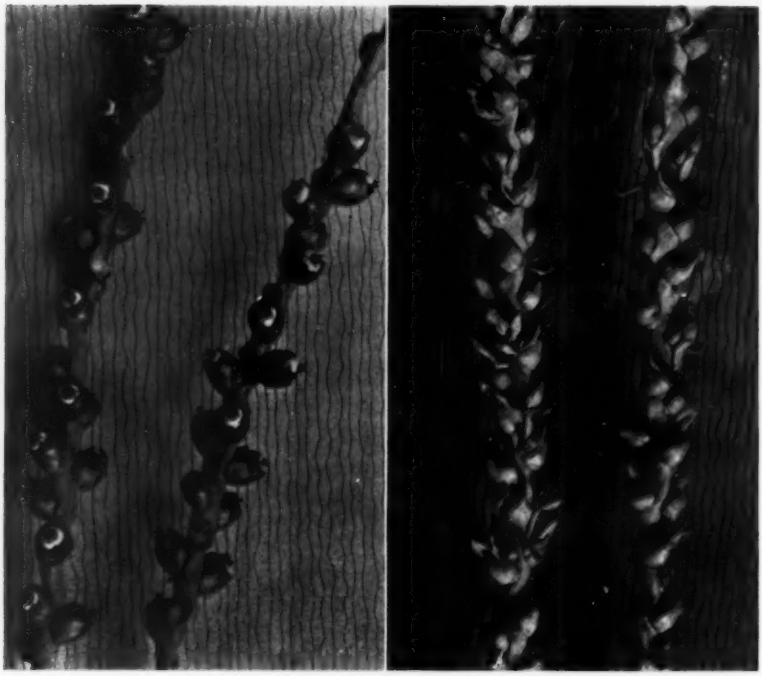
Cocos flexuosa, Hort. (not Martius).

Differs from *Arecastrum Romanzoffianum* itself in its narrow fruit and nutlet, the latter with pointed or acuminate or at least narrowed ends, the elliptic drupe with straightish sides mostly about 25 mm. long and about one-half as thick, but varying into smaller and apparently somewhat larger sizes.

Supposed to be a more slender palm than *A. Romanzoffianum*, but I have not observed this difference in trees that bear the fruit-shape of var. *australis*. It is frequently planted in the United States, but the *Cocos australis* of horticulturists is *Butia capitata*.

A. Romanzoffianum var. **botryophorum,** Becc. in Agric. Coloniale, x, 456, t. iii figs. 9, 10 (1916); reprint, p. 24. No. 6 in Fig. 7; Fig. 7A.

Cocos botryophora, Martius, Hist. Nat. Palm. ii, 118, tt. 83, 84 (1826), with exclusions apud Becc; Palmetum Orbignianum, 98, t. iv fig. 3, t. 30d.



6. FLOWERS OF ARECASTRUM ROMANZOFFIANUM, Brazil.—Left, pistillate, after anthesis, showing the tomentose covering on the pistils. Right, flowers in anthesis the stamens showing.

Syagrus botryophora, Martius, in Palmetum Orbignianum, 133 (1847); Hist. Nat. Palm. iii, 292 (1845), 324, emend.

Cocos Martiana, Drude & Glaz. in Martius, Fl. Bras. iii, II, 418, t. 83 (1882), and t. 89 excl. putamen.

Cocos Geriba, Barb.-Rodr. in Protesto-Appendice Enum. Palm. Nov. 43 (1879).

Stronger more robust tree than typical *A. Romanzoffianum* with big head or crown and large flowers and fruits: rachillæ stout, strongly angled: fruit broad-ovoid to broad-obovoid, 30-38 mm. long and 20 mm. or more broad; nutlet very broad but with acute ends, and rounding or ventricose sides.

Definition of the var. *botryophorum* is not yet clear. Apparently other palms have been confused with it, and these misinterpretations must be

7. Fruits of Arecastrum.—1-5, *A. Romanzoffianum;* 7, 8, var. *australe*, to be relatively broader when filled out. 9, a related genus that has been confused with var. *botryophorum*, and at 10 the cupule of it seen from below. About nat. size. 1, native *A. Romanzoffianum*, from trees shown in Fig. 1; 2, section showing curved seed inside the thick wall, planted tree in Rio de Janeiro; 3, from tree planted in Singapore; 4, nutlet from the wild in Argentina; 5, Demerara, British Guiana, not filled out, planted; 6, var. *botryopharum*, San Diego, Calif.; 7, three fruits of var. *australe* from planted tree in Demerara, British Guiana; 8, two fruits from planted tree in Rio de Janeiro.

eliminated. From one of the tropical botanic gardens I have fruits of a palm grown as *Cocos botryophora* that is presumably a Syagrus; a fruit of it is shown at 9 in Fig. 7.

The genus Syagrus, as we have learned, is one of the separations from the formerly confused genus Cocos. It agrees with Arecastrum in bearing a spathe grooved lengthwise and in having a plain rather than ruminate albumen. The flowers are usually very large; but it differs from Arecastrum particularly in its fruit. We can see in Fig. 7 that the seed of Arecastrum is an irregular body closely imbedded in the hard shell of the nut with a strong projection of the wall into it. The seed of Syagrus is a relatively regular body that lies more or less loosely in a central cavity.

7A. MATURE DRIED FRUITS of *Arecastrum Romanzoffianum* var. *australe;* the one at right var. *botryophorum*, the fibrous mesocarp showing. Southern California. About natural size.

8. TREES IN BEARING AGE of *Butia capitata;* southern California. At rear, right, a head of *Arecastrum Romanzoffianum.*

ARTICLE 2. THE BUTIAS.

The plants described in this article are chiefly represented in cultivation by the palm commonly known as *Cocos australis* and sometimes as *C. capitata*. The true *Cocos australis* of botanists, however, is a very different palm, being one of the forms of *Arecastrum Romanzoffianum* (*Cocos plumosa*). The tree in Fig. 8 at once distinguishes the group of which we are speaking.

These palms are native in southern and central South America. They are now much planted in the open ground in southern California, southern Texas and along the Gulf Coast, in Florida and southern Georgia and even as far north in the East as Wilmington, North Carolina.

The Butias are medium trees or large bush-like plants, typically in cultivation with a short covered stout trunk that may at last become nude by exfoliation, spine-bearing petioles, and stiff pinnate leaf-blades with the pinnæ standing upward at a strong angle from the rachis and then curving over at the end. Usually the foliage is grayish or glaucous-blue. The spadices or flower-clusters of the common species are long and prominent, branching once from a strong continuing axis, borne among the leaves and not reaching beyond them, issuing from a heavy long wooden smooth spathe.

The fruits are soft or fibrous bodies the size of a crab-apple, each bearing a single nutlet containing one to three seeds and that discloses the three pores at the lower end or near the middle characteristic of the Cocos tribe. These fruits are extensively variable, particularly in the synspecies *Butia capitata*, and are eatable and in some cases are employed in making preserves; because of the uncertainty that these fruits introduce into the identity of the species, this monographic study is largely undertaken. It is also the hope that an orderly set of names and descriptions may stimulate an even greater interest in these palms among horticulturists because their beauty and hardiness make them specially desirable in the warmer parts of the United States. They adapt themselves to common conditions of cultivation.

The present study is made in active cooperation with officers of the University of Florida, particularly in the persons of Professors H. H. Hume, Harold Mowry, Erdman West and of Lillian E. Arnold, and others of the staff have rendered generous aid. Many trees were marked by Mowry in different parts of Florida, from which he collected flowers and foliage in early 1935, and from which the author took fruits later in that year. Valuable assistance has been given by Father Jerome and others at St. Leo Abbey in Pasco County, by Norman Reasoner of the Royal Palm Nur-

series, Oneco, Florida, A. C. Jordahn of the Coconut Grove Palmetum, as well as by many persons in other states, particularly by J. Harrison Wright, Riverside, California, Ernest Braunton in Los Angeles, and formerly by the late Frank C. Patten of the Rosenberg Library, Galveston, Texas.

On the history of the Butias in the Lower South the following statement is prepared for me by H. Harold Hume of the Florida Experiment Station:

"Of hardy exotic palms brought into Florida and other parts of the Lower South, those belonging to the genus Butia have been more abundantly and widely planted than any others. Color, growth habit and the beautiful curvature of their leaves have commended them to palm fanciers and garden-makers over a wide territory embracing the coastal sections from South Carolina to Florida and from Florida to Texas. They are the hardiest of the pinnate palms adapted to the area. Foliage characters are developed fully when the plants are small and hence at all ages they are decorative. Ease of culture and adaptability to a wide range of conditions have combined to establish their place as garden favorites.

"General H. S. Sanford, in his time one of Florida's foremost plant introducers, started a plant introduction garden some time prior to 1873 near the town of Sanford which he founded. The land proved unsuitable and so in 1873 he moved his collections to another location in the vicinity. This he named Belair. It was here that the first Butia palm probably was planted in Florida.

"The early distribution of Butia palms (listed as Cocos) must be credited in the main to two sources: The Royal Palm Nurseries, Oneco, Florida, and the late Edmund H. Hart, Federal Point, Florida. The Royal Palm Nurseries were started in 1883 by the Reasoner Brothers, Pliny W. and Egbert N. Seeds were secured from General Sanford's palms and plants were offered for sale by this firm in their catalogue dated 1886-87, issued in the autumn of 1886. The palm, unidentified at that time, was described as follows: 'This beautiful pinnate-leaved palm has proved entirely hardy at Sanford; is one of the most desirable of all for open-air planting in Florida.' Later it was considered to be *Cocos Alphonsi* for in their catalogue dated December 1, 1899, this statement occurs, 'C. Alphonsi. The Belair palm of Sanford, Florida, where it was introduced years ago and forms large specimens. Is more stocky and of a quicker growth than *C. australis*, bearing edible fruit. Very hardy.' [*C. Alphonsi* is an unrecognized name, without standing.] In other catalogues of theirs beginning as early as 1888-89 different forms of Cocos belonging to Butia were offered—*C. australis*, *C. Bonneti*, *C. campestris*, *C. Gaertneri* and *C. Yatay*. These sorts were listed in part as coming from the central parts of southern South America,—Brazil, Uruguay and Argentina. Their

identity is indefinite and in later years the only name used is *C. australis* and apparently all were grouped under it.

"Edmund H. Hart in the late 1880's secured seeds of different kinds of Butias from German seed dealers and planted them on his place on the St. Johns River, Federal Point, Florida. Plants of his growing were sold and a considerable number were set out on his property. These later became the parents of many palms seen throughout the country. Part of the original Hart collection was purchased by the Glen Saint Mary Nurseries Company. Among the palms transplanted to their grounds are such species as *B. Bonneti*, *B. capitata*, *B. eriospatha* and *B. Yatay*.

"The late Henry Nehrling brought together a considerable collection of Butias at his home near Gotha in central Florida, and at St. Leo Abbey there are a number of fine specimens established through the efforts of Father Jerome who for many years has been interested in the group.

"In later years, notably between 1920 and 1930, Butia palms of several sorts were grown and sold by a number of Florida nursery firms under the group name *Cocos australis*. Large numbers were distributed in this way, notably by the Glen Saint Mary Nurseries Company, Glen Saint Mary, in northern Florida; C. H. Hoffner, Pine Castle, in central Florida; and the Royal Palm Nurseries, Oneco, in southern Florida. Other firms also grew and sold them in considerable numbers. In consequence Butia palms have been widely distributed throughout those parts of the southeastern states in which they may be grown."

Of the dozen or more species at present named in Butia, fewer than half are cultivated. To these we may now direct attention.

At the outset of our study we must note that the Butias are cultivated subjects, some of the species having been founded on plants grown in countries foreign to their origin, and that it is therefore difficult to define them in exact botanical terms. Others of the species are based on very insufficient material, with fruits unknown. Only a complete survey of the species as they occur in the wild in Brazil, Paraguay, Uruguay, Argentina, with good pictures and abandant preserved materials, can bring satisfactory order into the group. There is challenge here to botanists in the lands in which the genus Butia is native.

Only one comprehensive study of the group has been made, by Odoardo Beccari and published in Italian in 1916 in L'Agricoltura Coloniale, a monthly periodical of Florence, included in an article of 128 pages and 15 plates being entitled "Il Genere Cocos Linn. e le Palme affini." In the main, Beccari's view of the genus is adopted in the present paper, although apparently the plants grown in the United States constitute a different horticultural set from those planted in Europe.

Before Beccari, the systematic botanical work with these palms had been in the hands of Martius and Barbosa-Rodrigues, one of Munich and

the latter of Rio de Janeiro. To these men the species were in the genus Cocos. Martius described *Cocos capitata* in 1826 and *C. Yatay* in 1847, and his *C. eriospatha* was published by Drude in 1882; Barbosa published *C. leiocarpa* in 1877, *odorata* and *pulposa* in 1891 and his *paraguayensis* in 1899. Otherwise the making of specific names of cultivated kinds has rested with horticulturists, and the designations have been so general or inadequate that clear identification of most of them is impossible; therefore there will always remain elements of uncertainty in the bibliographic work. The best procedure, at least in the present epoch, is to follow Beccari as far as possible, although a number of dubious species have come into the literature since his time.

It would be futile to attempt a thorough monograph without much more material and notes representing the native plants than now exist. The writer's herbarium comprises a large collection of Butias (90 pigeonholes, standard size) grown in the United States and those in the botanic garden at Rio de Janeiro representing the plants of Barbosa-Rodrigues, together with abundant photographs, as well as material wild and cultivated from elsewhere, yet all this represents but a fragment of the whole problem. The present study is based largely on the attempt to clarify the forms in cultivation in the United States.

There is special difficulty in describing the species of Butia in cultivation in North America because so very few of the plants are of sufficient age to show the characters of trunk. Only seldom does one yet see an exfoliated bole. Many of the differences in aspect of trees may be juvenile marks that tend to pass away with full maturity. It is to be expected that seedlings of Butia will differ amongst themselves in shape of head, color and hang of foliage, and in stature as do seedlings of apple or sweet gum.

The greatest confusion, however, is in the size, shape, and color of fruits. No two trees in a plantation may be alike in their fruits. Whether these differences are variations due to new habitat and to effects of cultivation, or whether there is hybridization among the species, cannot yet be stated. These differences must be studied extensively in nature before the situation can be understood. Therefore it seems best not to discard distinctions made by predecessors on the basis of the cultivated material, even though there may be many intermediates. Perhaps this variation in fruit is not wider than one would see in numerous seedlings of peach or kaki. Future investigators must determine whether the fruit forms are to be accepted as botanically distinct, even if only in the category of varieties.

Most of the Butias in cultivation appear to be forms of *B. capitata*. It is strange enough that the ripe fruit of *capitata* itself, the first described species, has never been illustrated, and therefore my presentation of it may be open to interpretation. If we accept *B. capitata* in a broad sense (*sensu*

latiore) and assign a definite character to the type of it as originally defined by Martius (which is the prevailing North American method), we may then range the usual fruit forms under the three names *capitata*, *odorata*, *pulposa*.

Aside from the thick-fruited small-flowered Capitatas are the small-fruited and lesser plants of *Bonneti* and *leiospatha*, deep-hulled long-pointed large-fruited *Yatay*, and woolly-spathed *eriospatha*.

Species of Butia are very difficult to distinguish by means of original descriptions. They were mostly founded quite independently of each other. Of the seven botanically diagnosed species mentioned on page 19, only one (*paraguayensis*) is contrasted with a related kind unless in one or two cases by informal remarks on habit or general foliar differences. In fact, Barbosa in his great work on the palms of Brazil does not describe *capitata* or make any effective comparison with it even though it is the first species described and is native of that country. These Butias are from various regions in South America, however, but as the origin of plants in cultivation is not known we cannot avail ourselves of that aid. The characters of separation appear to lie largely in stature and in size and shape of fruit. Shape of seed follows shape of fruit. One does not feel certain, from original descriptions, whether trees described as acaulescent may not have been juvenile or at least undeveloped plants. I have not studied any genus of palms in which distinctions between supposed species are so unsatisfactory. Perhaps if I knew them as well in their native habitats as in cultivation in the United States I should find less difficulty.

On the subject of variation, we may pause with Beccari's statements, as read from the Italian:

"*Butia capitata*, taken in its widest sense, may be considered as a synspecies, exactly as *Arecastrum Romanzoffianum*, which has more or less the same geographic distribution in South America. The seeds of *B. capitata* introduced into Europe came from different regions, where local forms exist and have given rise to those varieties of forms found in our gardens, and especially those from Brazil and Argentina where this Butia, besides reproducing naturally is also cultivated as an ornamental and for its fruits which are not undesirable and which in some species have a delicious taste and can be made into a conserve.

"Based on numerous specimens, notes, drawings, and photographs referring to the individuals I had personally seen or had been sent to me by my colleagues from various parts of Italy, southern France, Portugal, the Canary Islands, etc., and from South America and from the descriptions and illustrations published in the different works of Barbosa-Rodrigues, I have come to the conclusion that with *Butia capitata*, whether wild or in culture, there exist numerous forms and varieties, of which the principal ones (of those in my knowledge) are described here, attempting, probably

in vain, to point out those characteristics from which they may be recognized. In truth it is probable that each one of these is not representative of constant and true races, but only individual variations, being almost certain that either because of the natural widespread dissemination of this palm in its native habitat, or by its extensive cultivation, strange forms may result by natural crosses in the New as well as the Old World."

THE GENUS BUTIA

BUTIA, Becc. in Agric. Coloniale, x, 489 (1916); reprint, p. 39.
Cocos subg. *Butia*, Becc. in Malpighia, i, 352 (1886).

Monœcious pinnate-leaved erect single-trunk palms of low or intermediate stature, or trunk sometimes apparently wanting: bole stout, thick for its height, covered for years by broken petioles with expanded bases

9. SEEDLINGS OF BUTIA CAPITATA, three or four years old; northern Florida; to show trunk formation and habit.

making pockets in which seeds may start but eventually becoming nude on the lower part by exfoliation (Fig. 21) but the younger petioles often remaining under the leaf-crown and making a shaggy subhead or capital that is likely to be singularly misrepresented in pictures; subterranean extremity of trunk a straight knob-like end from which cord-like roots extend (Fig. 9): leaves long-pinnate, mostly somewhat glaucous or with a bluish cast, rachis convex underneath and keeled or ridged on upper side, petiole expanded toward base and bearing irregular flat prongs or spines along the thin margins and commonly, also, more or less fibrous or shaggy material; pinnæ 25-50 or more pairs placed mostly separately on the rachis or sometimes in groups of 2 or 3, trough-like, narrow (2½ cm. or less broad), with strong midrib and many close parallel side veins, tip variously bilobed: spathe interfoliar, comprising two parts or valves, the inner or conspicuous one being long and narrow and woody, sometimes more than 1 m. long and pointed, inconspicuously fine-nerved lengthwise but not grooved or sulcate or keeled, dehiscing lengthwise along the lower side: spadix an elongated strongly peduncled body nearly or quite the length of spathe, simply branching along the axis: flowers unisexual, both on the same spadix; on the lower part of lateral branches more or less irregularly in 3's with the central one pistillate, on upper part all staminate and soon caducous; staminate flowers with more or less distinct coverings representing 3 sepals and 3 valvate petals, the latter much the larger, stamens 6, little if at all exserted at anthesis; pistillodium usually present as a single erect 3-lobed body

10. PRIMARY OR OUTER SPATHE of *Butia capitata*, at the base of the large main or secondary spathe; Florida. Front view below.

(Fig. 12 C and E); pistillate flowers short-conic, with imbricate nerved envelopes, pistil single, glabrous, stigmas 3, compartments of ovary primarily 3: fruit a more or less soft drupe sitting in a permanent enlarged 6-parted perianth or cupule; nutlet 1, conforming in general to form of drupe, developing 1, 2 or 3 seeds of regular shape, a micropylar pore over each compartment at or mostly below the middle; albumen homogeneous, hard, white; embryo more or less lateral.

The general descriptive morphology is explained in the illustrations.

The spathe in Butia is commonly not properly observed. It is duplex, composed of a minor and a major part, as in other cocoids. The minor or outer spathe is a flattened two-edged short tubular organ from which the major or inner part emerges (Fig. 10). It is perhaps 1 foot long more or less, 1½ to 4 inches broad, and is borne deep down in the leaf axil and is commonly overlooked. It is persistent, but with the emergence of the inner larger spathelet (which is the conspicuous and well-known part) it may become split at the edges and torn, and after a year or so remains as a shapeless body without significance to the casual observer. Its position, much compressed at the base of the petiole, renders it difficult to collect, and it may not appear in descriptions. Beccari speaks of it as a short basal narrow tubular sheath opening at the apex ("una spata basilare breve, tubulosa, strettamente guianante, pervia all'apice").

The generic name Butia is unfortunate because of its similarity to the older leguminous Butea, but the two are entirely different words, not variable spellings of the same word, and both are allowable under the Rules. The word Butia is a Portuguese corruption of a vernacular in the lands of their nativity. As early as 1886 Beccari had separated these palms as a subgenus Butia of Cocos. In 1903 J. Barbosa-Rodrigues, in his monumental Sertum Palmarum Brasiliensium, made a subsection Butia of Cocos for most of these palms but placed others of them in his subsection Harykury.

For our purpose the genus Butia may be divided into two parts, although it is not yet known whether these divisions represent morphological differences of importance:

I. The Major Butias, soon or eventually developing a conspicuous and often tall trunk, bearing abundantly of soft-fleshed or at least fibrous-fleshed yellow, tawny or red fruit, in midsummer: secondary or large spathe (spathe-valve) prevailingly more than ½ m. long: comprises the cultivated species. Page 25.

II. The Minor Butias, acaulescent or prevailingly without evident trunk: spathe and spadix ½ m. (or to 60 cm.) or less long and often very short and small: fruit mostly unknown or undescribed: not known to be in cultivation, at least in North America. Page 45.

Other names than those in the following monography, on plants in cultivation in California, belonging to the genus Butia are *Cocos comosa*,

C. lepeda, *C. littoralis*, *C. vinifera*. Material in the author's herbarium lacks flowers and fruits of these plants, and the names cannot be identified. They are all smooth-spathed thick-trunked plants. *Cocos comosa*, Martius, is now *Syagrus comosa*, but the plant I have seen in cultivation under this name is a Butia. The other names are without botanical standing. *Cocos Yurumaguas*, also without standing, planted in southern California, is probably a form of *B. Yatay;* the fruits appear to be nearly as small as those of *B. paraguayensis*, but the tree is large. The palm *Yurumaguas* is unknown to Beccari except as the name occurs in L'Illustration Horticole, 1881, page 16 and in Revue Horticole, 1885, page 232; he calls attention to the fact that Yurimagus is a geographical name in the Amazon region of eastern Peru. *Cocos humilis*, a trade name, is mentioned under *B. capitata* var. *strictior*, page 32.

In Florida, a palm has been grown under the name *Butia argentea* (Nehrling, American Eagle, Sept. 5, 1929, p. 5). The following account is given by Nehrling: "While examining the fine collection of exotic plants in the conservatory of Audubon Park in New Orleans, in November, 1891, I found a most beautiful Butia palm in full fruit. A number of them were scattered over the ground underneath the plant. Their color was a vivid orange-red and their size suggested a rather large cherry. The superintendent was kind enough to let me have a few of these fruits which all germinated in my garden at Gotha. The foliage of the Palm, which was labelled *Cocos argentia*, was of a pure silvery-white, and very distinct from that of all the Butia Palms in my collection. I have named it *Butia argentea*. I have three specimens of this species, but so far they have never flowered or fruited satisfactorily." This description calls for a palm like *Nehrlingiana* in fruit but silvery in foliage. In Nehrling's Plant World in Florida, 1933, edited by Alfred and Elizabeth Kay, it is stated, page 115, that *Cocos argentea* "has not yet flowered, and I have not seen it growing anywhere else." The name *argentea* did not accompany any of the Butias purchased from the Nehrling estate by the Coconut Grove Palmetum. The *Cocos argentea* of botanists (Engel) is now *Syagrus argentea*, Becc., native in Colombia, a very different palm.

Nehrling mentions *Butia campestris* as "the smallest of all the species in my collection. The trunk is slender, the leaves are short, and the fruits, which appear in much branched clusters, are small, not larger than a full-sized pea" (American Eagle, Sept. 5, 1929). This is apparently not the *Cocos campestris* of Martius, which is *Syagrus campestris*, Wendl. Beccari speaks of a *Cocos campestris* in gardens that is not a Syagrus but a Butia and often referable to *B. capitata*. In California I have taken material from a palm known as *Cocos campestris*, but it is a Butia, apparently *B. capitata*.

Nehrling also records *Butia petræa* as "grown from seeds, which I received through the bureau of the late Dr. Fritz Mueller of Blumen

[Blumenau?], Brazil. It is a distinct species, with rather upright leaves and small clusters of fruits the form and size of acorns." *Cocos petræa*, Martius, is now *Syagrus petræa*, Becc., probably not the palm of Nehrling.

I. The Major Butias, comprising the cultivated species (p. 45).

A. Exterior of woody spathe-valves glabrous: tip of pinnæ little or only shallowly bilobed, usually not deeper than about 2 cm., lobes not divaricate: mature buds of staminate flowers in most species or forms rather broad or triangular at base (usually to 4 mm. broad): bracts subtending staminate flowers in most cases not conspicuously divaricate-pointed: pinnæ variously placed on rachis: fruit various.

B. Fruiting perianth or cupule (at base of mature fresh fruit) short, composed of very broad obtuse or abruptly short-pointed parts, making a shallow cup or saucer: mature fresh drupe globose or ovoid or broadly short-conic or depressed, with curved sides and not gradually produced into a beak or narrow summit: nutlet prevailingly much less than twice longer than broad or at least not attenuate: tip of pinnæ indifferently or not noticeably (or at all) bilobate: branches of inflorescence (spadix) nearly or quite straight or only mildly sinuous (variable in cultivation): buds of staminate flowers in anthesis 5-6 mm. long (in *capitata*), of pistillate 8-10 mm. or less.

C. Spathe (major spathe-valve) large and broad, usually 1 m. or more long in full length: pinnæ on main part of full-grown strong leaves 75 cm. or more in length and mostly nearly or quite 2 cm. or more broad at middle: fruit at fresh maturity usually not distinctly conic and upwards of 16 mm. diameter, soft and pulpy: large plants ..... *B. capitata*, sens. lat.

D. Leaves (except the topmost) strongly arching outward or horizontal or drooping, only the petioles being erect or upright.

E. Foliage variably glaucous-blue, usually pronouncedly so: pinnæ either equally spaced or in groups on the rachis: fruits various.

F. Fruit yellow, greenish-yellow, or tinged red at maturity, mostly large: staminate flowers cream-color or greenish, sometimes lilac on the upper half.

G. Drupe (when fresh and mature) ovoid, longer than thick, 25 mm. or more high, abruptly tapered to short small point or apicule ..... 1. *B. capitata*

GG. Drupe depressed endwise, scarcely or not at all pointed at maturity or at least not tapering, broader than high.

H. Size of mature fruit about 20 mm. high by 25 mm. broad: nutlet about 15 mm. diameter ..... var. *odorata*

HH. Size of mature fruit as much as 30-35 mm. diameter and often less in height, very soft and pulpy . var. *pulposa*

FF. Fruit bright red at maturity, small: both staminate and pistillate flowers violet-red ..... var. *Nehrlingiana*

EE. Foliage uniformly green on both surfaces: pinnæ equally spaced on rachis: fruit as broad as long, or broader . . var. *virescens*

DD. Leaves strongly upright-ascending, bluish, only the ends of the outer ones somewhat recurved, inside of crown being a dense mass of erect leaves: inflorescence erect ..... var. *strictior*

CC. Spathe (major valve) not much exceeding ½ m. (to perhaps 65 cm. in some cases) and narrow, often fusiform: pinnæ on main part of mature leaves 10 dm. (40 inches) or less long and 15 mm. or less broad at middle, equally placed on rachis: plant small or not robust, with short or slender trunk.

D. Drupe ovate, 15-16 mm. thick ..... 2. *B. Bonneti*

DD. Drupe elliptic with more or less straight sides, about 12 mm. thick ..... 3. *B. leiospatha*

BB. Fruiting perianth extending one-third to one-half length of the drupe, some or all the parts narrow or gradually long-pointed: mature fresh drupe elongated or distinctly longer than broad, produced into a narrow apex almost or quite like a beak or at least prominently acute (particularly when dry): nutlet large, elongate, with one or both ends attenuate, nearly or quite twice as long as broad: pinnæ equally placed on rachis; tip of pinnæ likely to be rather prominently bilobate (but not so conspicuously or divaricately as in *B. eriospatha*): branches of inflorescence (spadix) noticeably strongly undulate or crooked especially in lower half, the curves often departing as much as 1 cm. from a median line: buds of staminate flowers at anthesis 8-10 mm. long, of pistillate to 15 mm. or more: fruit at fresh maturity 35 mm. or more long: plant very stout, becoming large.....4. *B. Yatay*

AA. Exterior of spathe-valves distinctly brown-woolly or -tomentose (eriose), the covering persistent even if in patches after the fruit has perished and sometimes evident in the following year, particularly noticeable on the long major valve: pinnæ evenly spaced on the rachis unless at very base of leaf, and with elongated narrow ends; tip of pinnæ tending to be prominently bilobed to 2½-8 cm., lobes usually strongly divaricate and one of the more filiform lobes sometimes 5-17 cm. long (these very slender lobes fall or are broken as the leaf ages and are therefore to be seen in perfection on the newer, upper or narrower pinnæ; they may not show on carelessly made herbarium specimens, although dry basal parts of them may be present): staminate flowers (when closed in bud at anthesis) narrow and very angular and usually crooked, in dry state about 5 mm. long and 2 or 3 mm. broad, nearly uniform in width, lightly nerved: bract at base of staminate flower becoming strongly divaricate, sharp-pointed, so that the rachis usually presents a spinulose or echinate look after flowers have fallen: fruit approximately 20 mm. high and somewhat broader (with larger variations), the cupule small and hardly extending up the side of the drupe..5. *B. eriospatha*

1. **Butia capitata,** Becc. in Agric. Coloniale, x, 507, t. v. figs. 7, 8 (1916); reprint, p. 57. BRAZILIAN BUTIA. Figs. 8, 11, 12, 13, 14, 15.
Cocos capitata, Martius, Hist. Nat. Palm. ii, 114, tt. 78, 79 (1826).
Butia capitata var. *subglobosa*, Becc. l.c. 513; reprint, p. 62.

Stout tree with caudex becoming 3-5 m. tall (10-16 feet) and eventually exfoliated, but known in cultivation yet with us as a tree with leaves nearly or quite touching the ground and trunk 1-3 feet high covered with large petiole-bases: leaves 1-2 m. or even more long, upwardly over-arching, light blue or glaucous at least on under surface; stout petiole with base to 8 cm. or more broad and bearing many stout spines or prongs to 4 cm. long; pinnæ firm, mostly evenly and singly spaced on rachis which is rounded underneath and broadly ridged above, the main leaflets to 20 mm. or more broad and 70 cm. or more long, not prominently thin-tapering, apex bilobed (if at all) mostly not exceeding 2 cm. deep: major spathe 1-1½ m. long, 6-8 cm. broad, glabrous, gradually long-tapering to a point: spadix above peduncle 75 or more cm. long, glabrous, with many branches, densely flowered, ochroleucous or greenish, the bracts subtending staminate flowers not conspicuously divaricate-pointed: staminate buds at period of anthesis mostly broad (about 4 mm., to 5 or 6 mm. tall), angled but not contorted or crooked, somewhat triangular, prominently many-nerved; pistillate flowers 7-10 mm. long: fruit ovoid to ovoid-conic, yellow, pulpy, 24-26 mm. high (about 1 inch) and 20-22 mm. thick and with sides little curved at middle, bearing at the apex a very short point or umbo; cupule shallow and usually not more than one-fifth or one-fourth length of the drupe, the parts

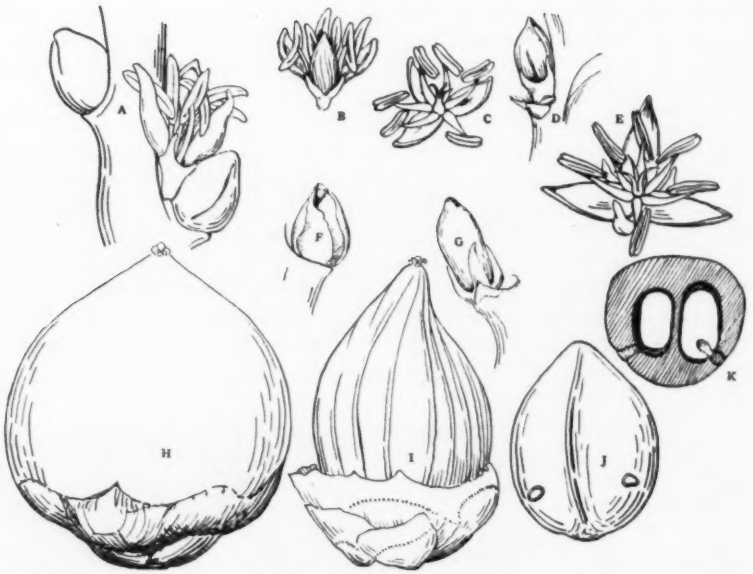
very broad and not attenuate but perhaps short-pointed at center; nutlet globular-oblong and very abruptly narrowed at apex (18 mm. long and 15 broad) to oblong and more evidently pointed (22 x 14 mm.), pores prominent, cells or compartments 1-3.

Ascribed by Martius to the eastern central part of the State of Minas Geraes, which is in the eastern somewhat southern part of Brazil and not bounding on the Atlantic. Martius gives a full diagnosis but makes no contrasts with related species, and his portrait of a tree is probably only approximate as to the upper part of the trunk. In his picture of details the staminate buds are given a lilac tinge although his description makes the staminate flowers ochroleucous. He did not know mature fruits and his description is brief and lacks measurements, and fruits are not included in his illustrations. His portrait of a tree (t. 78, Hist. Nat. Palm. ii) is not characteristic of the external appearance inasmuch as it was made from a plant damaged by fire which the people start to clear the land of grasses. The top part of the leaf-shag is not likely to burn completely, being greener, and the remaining mass may have given Martius the reason (as suggested by Beccari) for naming the palm *capitata*.

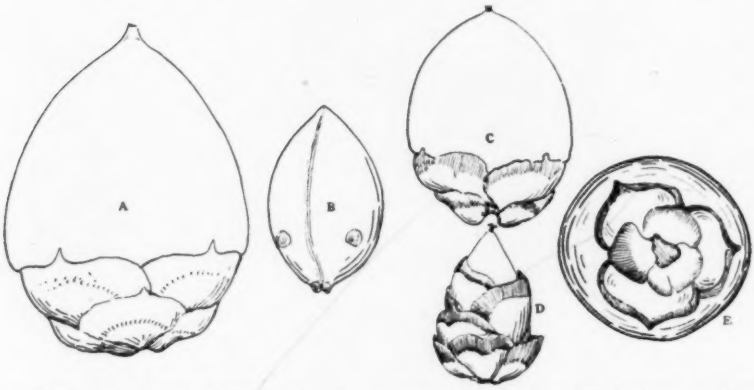
The species in its typical form apparently has a wide natural distribution in Brazil of some 12-14 degrees of latitude, reaching its southward range in Rio Grande do Sul and Uruguay.

Two sheets of

11. INFLORESCENCE OR FLOWER-CLUSTER (spadix) of *Butia capitata*, the spathe standing behind; Florida.

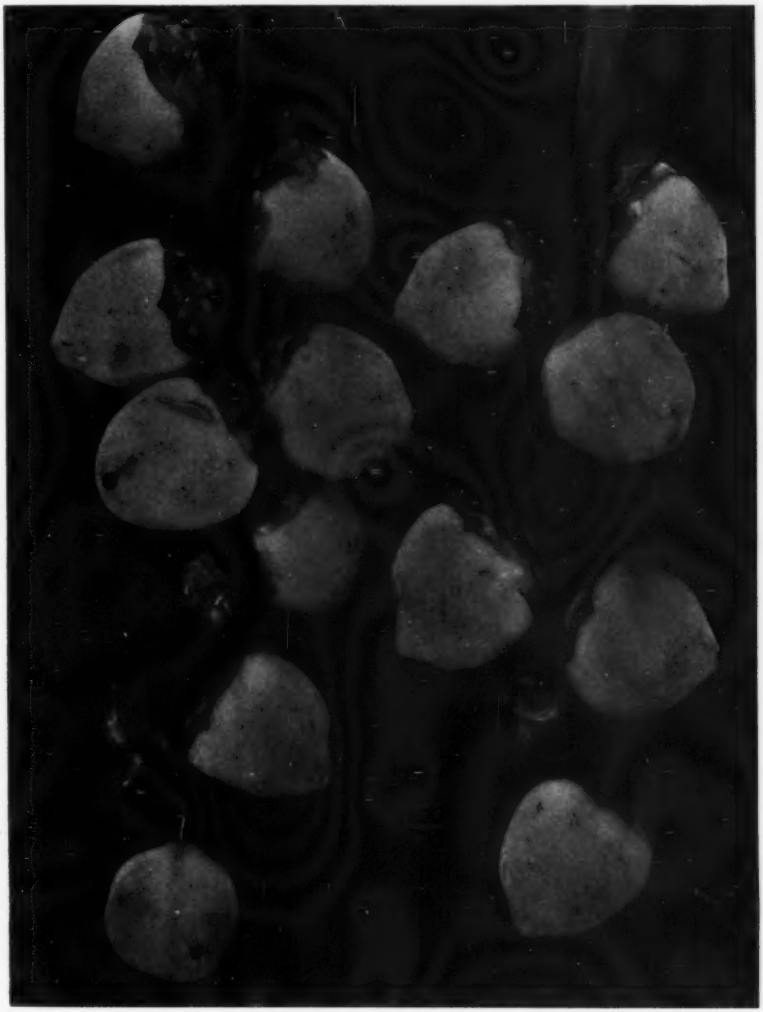


12. FLOWERS AND FRUITS of Butia, about twice natural size. A, B, C, D, F, are *B. capitata*, A, showing one staminate and two pistillate flowers. E, G, are *B. Yatay*, G being a staminate bud. H, I, J, K, fruits of *B. capitata;* I, partially dried drupe sitting loosely in its cupule; J, nutlet showing two of the three micropyles; K, cross-section of nutlet, showing two seeds and micropyles.



13. FRUITS OF BUTIA CAPITATA, slightly enlarged. A, normal or typical shape, and B the nutlet with two micropyle's showing. C, another form, and D the same when very young and mostly inclosed in the cupule. E, the mature cupule seen from underneath.

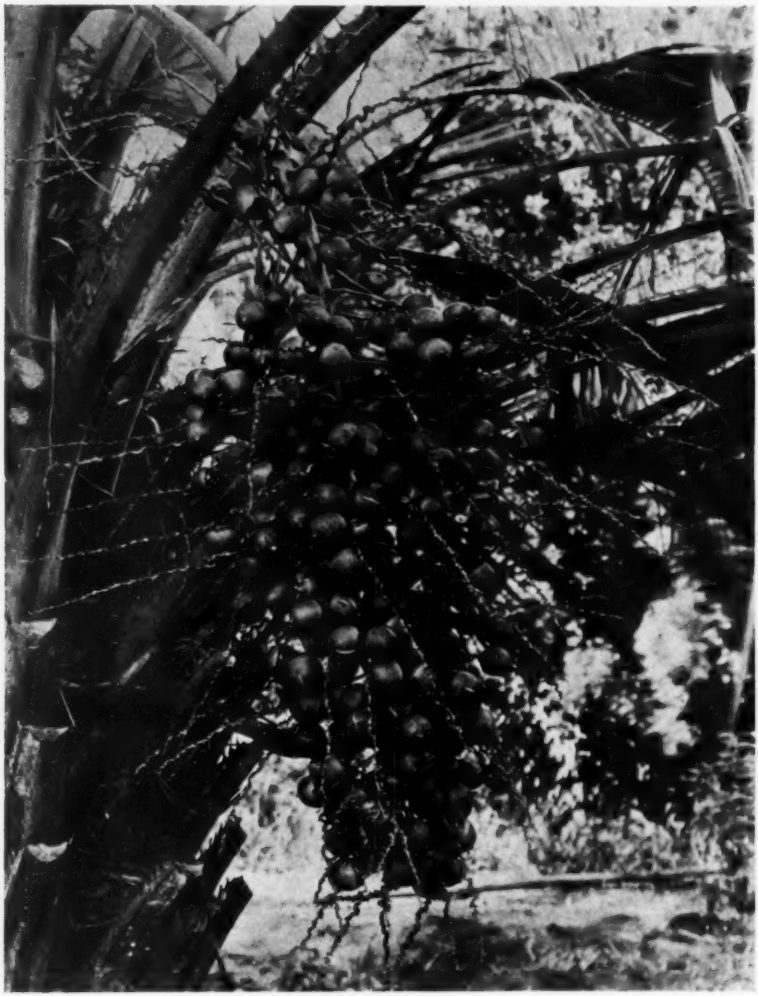
Martius in the herbarium at Munich represent type material of his *Cocos capitata*. They are from Minas Geraes, Brazil, the one in bloom dated August although in his text Martius says he had seen it in bloom in May, June and July. The specimens are two spadices and pieces of leaves, as



14. MATURE FRESH YELLOW FRUITS of *Butia capitata*, practically natural size; Florida.

well as tip of a very small spathe perhaps immature. This material appears to be the same as the palms passed in the present paper as *Butia capitata*.

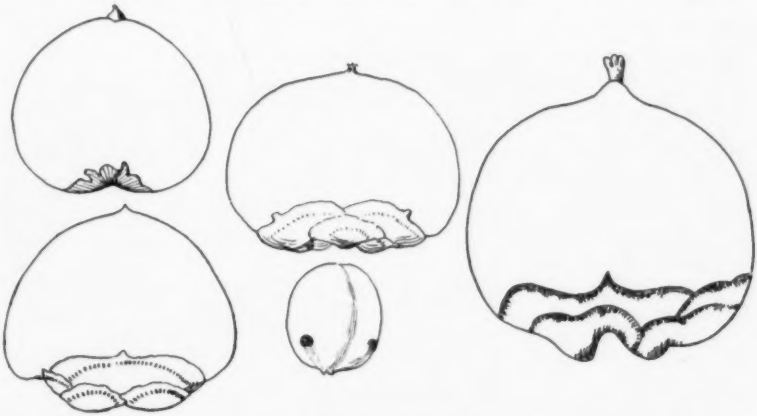
Beccari concludes, from his studies, that *Butia capitata* itself is the most northern form in nature and therefore most tropical, that var. *odorata* is most common in the states of São Paulo and Santa Catharina which are



15. FRUIT-CLUSTER of *Butia capitata*, in Florida.

farther south in Brazil, and that var. *pulposa* is the most southern being abundant in Rio Grande do Sul as indicated by Barbosa. I have not been able to confirm such climatic adaptations in my observations in the United States.

This plant, *Butia capitata*, appears to be the commonest species planted in the United States. I have collected it in southern California, southern Texas, Louisiana, Mississippi, abundantly in Florida, and have seen it and



16. FRUITS OF VARIETIES of *Butia capitata*, of trifle over size. Upper left, copied from Barbosa of var. *odorata;* lower left, var. *odorata*, Florida. Center and right, var. *pulposa*, the upper center from Barbosa; lower center, nutlet with two micropyles in evidence; right, Florida.

have fruits from the open in Wilmington, North Carolina. Dr. R. M. Harper reports it planted in Tuscaloosa, central Alabama.

B. capitata var. **odorata,** Becc. l. c. 513 (1916); reprint, p. 63. Fig. 16. *Cocos odorata*, Barb.-Rodr. Plant. Nov. Cult. Jard. Bot. Rio, i, p. 11, t. ivA (1891); Sertum Palm. Bras. i, 92, fig. t. 68A (1903).

Known by its broad-conic to depressed-globose fruit not much exceeding 20 mm. in axial length and often 3-5 mm. broader than that: nutlet nearly globular, about 13 mm. high.

Native in Rio Grande do Sul, the southernmost state of Brazil and also on the island De los Padres in the Cebolaté River in contiguous Uruguay.

Plants recognizable as bearing the particular fruit-form and the green-yellowish flowers of var. *odorata* in this country are relatively few in my collection, but probably this form is not uncommon.

B. capitata var. **pulposa,** Becc. l. c. 516 (1916); reprint, p. 65. Fig. 16. *Cocos pulposa*, Barb.-Rodr. Plant. Nov. Jard. Bot. Rio, i, p. 14 t. ivB

(1891); Contrib. Jard. Bot. Rio, ii, 38, t. iii B a-c (1901); Sertum Palm. Bras. i, 94, fig., t. 68C (1903).

Cocos odorata, Daveau, in Rev. Hort. 1893, fig. 110.

Distinguished by its very large and pulpy flattened fruits which are 25-32 mm. in axial diameter and 30-35 mm. broad: nutlet nearly globular, sometimes 15-17 mm. high and broad.

Nativity is the same as of var. *odorata*. It is apparently of similar or greater frequency in cultivation in the United States and presents no definite characters of demarcation; the two forms merge in fruit size and shape.

The *Butia pulposa* of Nehrling in Florida is probably an Arecastrum.

B. capitata var. **virescens,** Becc. l. c. 519 (1916); reprint, p. 60. GREEN-LEAVED BUTIA.

Palm with brilliant green foliage; pinnæ mostly equidistant on the rachis, about 60 cm. long and to 23 mm. broad: spadix as large as in other forms of *capitata*, from a glabrous spathe glaucescent when in bloom: flowers greenish-yellow or lilac tinged: fruit globose-depressed, 15-18 mm. high and 20-25 mm. diameter, whitish with rose-color at base, fragrant, succulent; nutlet small and spherical, 10-13 mm. diameter.

Cultivated in Italy, and a few trees seen by the writer in New Orleans, Louisiana; reported also from northern Florida.

† **B. capitata** var. **strictior,** var. nov.

Palma strictissima: folia erecto-ascendentia, curvantio solum apice, non obtegentia truncum; pinnæ angustatæ, cæruleo-viridis, glauciores: fructus ovoideo-conicus, cupula brevis.

Tree markedly erect and strict, the trunk conspicuous because not obscured by foliage: leaves with long slender erect-ascending petioles, the plume-like blades strikingly upright and outer ones arched only at summit, the center of the head or crown being a dense fascicle of erect foliage, the leaf bluish-green and slightly glaucous; pinnæ on main part of blade narrow, 1-2 cm. broad at middle, somewhat unequally spaced on rachis, tip-lobes (if any) not divaricate: inflorescence very strict; spathe 1¼ m. or so long, narrow, smooth; flowers greenish-yellow or ochroleucous: fruit ovoid-conic, about 2 cm. long, the shallow cupule with blunt parts.

A single tree in Pasadena, California, comprises the type of this variety (Fig. 18). It was first called to my attention in 1935 by Ernest Braunton of Los Angeles and I subsequently visited the palm, finding it to be about 16 feet high. In 1927 I had taken what now appears to be the same palm on the estate of J. W. Gillespie at Montecito, near Santa Barbara, California, where it was grown under the label name *Cocos humilis*. Whether this very distinct-looking palm, var. *strictior*, is anywhere native or is a horticultural variation is unknown to me.

† **B. capitata** var. **Nehrlingiana,** stat. nov.* Fig. 17.

Cocos and *Butia Nehrlingiana,* Abbott; Nehrling, in American Eagle, Sept. 5, 1929, p. 1 (Estero, Fla.); *B. Nehrlingiana,* Bailey, in Hortus, 105 (1930).

Cocos Nehrlingii, Kay, Plant World in Fla. 117 (1933); *Butia Nehrlingii,* syn.

Large Butia with trunk to 2 m. or more, known by the pronounced violet-red color of the flowers of both sexes and the bright red oblong-

17. ORIGINAL TREE of *Butia capitata* var. *Nehrlingiana* at Gotha, Florida; now dead.

**Status novus:* Gent. Herb, i, p. 8.

18. THE TREE IN PASADENA on which *Butia capitata* var. *strictior* is founded. Palm at extreme right in background, *Arecastrum Romanzoffianum;* two thick-topped trees to left of it, *Cordyline australis* of the lily family.

conical small fruits with cupule about one-fourth length of drupe: leaves 2-3 m. long, much recurved, glaucous-green.

The tree to which the name *Nehrlingiana* was applied stood by the residence of the late Henry Nehrling at Gotha, Florida; this plant was removed to the Coconut Grove Palmetum at Miami, but it subsequently died. I have photographed it and taken specimens at both places. Nehrling states (American Eagle, Sept. 5, 1929) that he received a few seeds in 1892 from the late Dr. Herman Burmeister of Buenos Aires. How many plants of this beautiful palm may exist in Florida is unknown to me. Nehrling writes of it that "the flower-trusses are much branched and very large, 3 feet long, and the fruit is not closely set, but more or less scattered. Its size does not exceed that of a small cherry, and the color is a vivid red."

Three other varieties of *Butia capitata* are described by Beccari, but are not known to have been collected in the wild in South America and are not recognized in cultivation in the United States. These are now recorded:

B. capitata var. **erythrospatha**, Becc. l. c. 515 (1916), reprint p. 65 (*Cocos erythrospatha*, Chabaud, in Rev. Hort. 1905, 516 and 1906, 144 and Les Palmiers Côte d'Azur, 80). RED-SPATHED BUTIA.

Trunk, as described, to 1½ or 2 m.: pinnæ green, bifid at apex, irregularly disposed those at the middle being arranged in groups of 2 to 5: spathe smooth, colored, principally at the summit, with reddish or dark brown: spadix to 1¼ m. long, colored lilac: fruit ovoidal, about 22 mm. long, apricot-yellow, perfumed like pineapple; cupule about one-fourth length of drupe, the parts broad; nutlet globose.

Cultivated in France.

B. capitata var. **elegantissima**, Becc. l. c. 517 (1916), reprint p. 67 (*Cocos elegantissima*, Chabaud, l. c.; Les Palmiers Côte d'Azur, 77).

Trunk to 3 m.: leaves elegantly arched-recurved, petiole spines recurved; pinnæ linear and rigid, mostly equally separated, largest to 22 or 23 mm. broad, glaucous-whitish: spathe smooth: spadix 1½ m. long, whitish: flowers more or less violet: fruit globose-depressed, variable in size, 20-30 mm. high and about equal in thickness, yellow, perfumed like a peach; cupule small, not extending up the sides of the drupe; nutlet subglobose to somewhat ovoid, to 15 or 16 mm. high.

Cultivated in France.

B. capitata var. **lilaceiflora**, Becc. in Agric. Coloniale, x, 518 (1916), reprint p. 68 (*Cocos lilaceiflora*, Chabaud, l.c.; Les Palmiers Côte d'Azur, 83, fig. 1915).

Stout palm, 1-2 m., known particularly by the lilac bloom, the sepals and petals of staminate flowers being violet or purplish, pistillate flowers violet-tinted on the apex and yellow at base, fruits ovoid, chamois-yellow, typically 23-24 mm. high and 20-22 mm. thick (as described by Chabaud),

pinnæ borne singly or sometimes in twos, green above and somewhat glaucous underneath: spadix 1.25 m. long, bearing 110-120 branches: nutlet ovoid.

Origin unknown. Chabaud reported two trees or plantings in France, both in Toulon. Beccari does not add localities. Chabaud states that the fruit in his plant has a thick flesh, acid-sweet with aroma of pineapple and Reinette apple.

Lilac-flowered Butias are frequent in the United States but they appear

19. PLANT, NUTLET AND FRUIT of *Butia Bonneti* as understood by Beccari; known to Carrière in Revue Horticole, 1876, as *Cocos australis*.

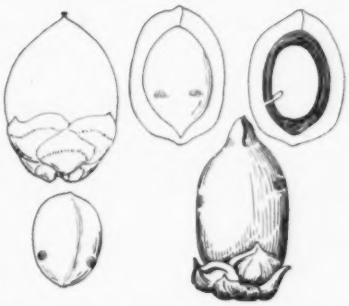
to be only color phases of *B. capitata*, and the fruits do not follow the shapes and dimensions stated by Chabaud and Beccari, and are as variable as in *capitata* itself; they appear to have no systematic significance and I therefore hesitate to separate them as a botanical unity. In these American examples the staminate flowers usually show marked lilac color on the upper half.

Beccari states that in all the forms of *Butia capitata* examined by him he never found worth-while differences in the flowers. "I have observed," he says "only some diversity of color, at times pink, at times distinctly violet, a variation in color that extends to the various parts of the spadices, comprising the spathe."

2. **Butia Bonneti,** Becc. in Agric. Coloniale, x, 504, t. v figs. 4, 5, 6 (1916); reprint, p. 58. ACORN BUTIA. Figs. 19, 20.
Cocos Bonneti and *Cocos Gaertneri*, Hort., at least in part.

As defined by Beccari this palm is a smaller plant than *B. capitata*, with shorter strongly arcuate (or arching) leaves, petiole with much more slender spines, pinnæ equally distant on the rachis, the largest only 30-35 cm. (to 14 inches) long and 12-15 mm. (about ½ inch) or even less broad: spadix 50-60 cm. (to 24 inches) long, the spathe narrow, fusiform, glaucescent when in bloom: flowers small: fruit ovate, about 20 mm. high and 15-16 mm. broad, conical-pointed, cupule extending about one-third length of the drupe; nutlet elongate-elliptic, acute at either extremity, about twice as long as broad.

I have seen only two trees that bear such small leaves, pinnæ and spathes and spadices and flowers, and proper character of fruit, as the description demands, both of them in Florida, although I know other trees grown in California, Texas, Louisiana and Florida passing as *Cocos Bonneti* and *C. Gaertneri* that are clearly *B. capitata*. Spathes are very variable in the cultivated Butias and I do not place great dependence on size unless correlated with other characters. Size of plant, by itself, may not be significant inasmuch as our cultivated Butias are yet young, and much must depend on soil and location. All the plants and specimens I have seen under the names *Bonneti* and *Gaertneri* appear to be only variants of *B. capitata;* this observation agrees with the statement of Beccari that *B. Bonneti* and *B. leiospatha* can be considered as "simple varieties or at least as sub-species" of *B. capitata*. I am leaving final disposition of the case in abeyance, however, until further experience appears to demand conclusions.



20. FRUITS of *Butia leiospatha*, natural size. Two upper right, sectioned, from Barbosa. Lower right, from Drude. Two left, Florida, referred here provisionally.

Aside from the biological question involved in this case, the nomenclature is itself quite beyond elucidation. What may be now grown under the various names may not be the same botanically as the plants originally introduced to cultivation; and there are no herbarium specimens, apparently, to verify the identities of the horticultural things. Seeds supplied me by a European dealer as *C. Bonneti* are apparently of two species.

This small Butia with short narrow pinnæ, narrow major spathe and acorn-like fruit has no dependable botanical name. It has been described, up to the time of Beccari in 1916, in horticultural terms rather than to distinguish it accurately. In fact, we do not know whether the two names under which it passes originally designated the same plant.

The palm first known as *Cocos Bonneti* was introduced as seeds from Mexico and dedicated by the Belgian nurserymen Linden in 1865 to M. Bonnet, inspector-general of bridges and roads of the city of Lyons, France, and an ardent horticulturist, who planted it in Hyères, southern France. The name appears not to have been botanically published, however, and therefore has no standing. The name was listed as early as 1878 by Wendland in Kerchove's Les Palmiers but only as a *nomen nudum;* and it occurs under similar circumstances in L'Illustration Horticole in 1881 and in Revue Horticole in 1885. B. Chabaud discusses it in Revue Horticole in 1910, citing the above history and saying it is the same palm discussed and figured in Revue Horticole in 1876 (p. 155, fig. 33) as *Cocos australis* and which he says is the same as *Cocos Yatay*; this picture, which is reproduced same size in Fig. 19 is not *Yatay*, however, and Beccari cites it as true *Butia Bonneti;* Chabaud correctly figures fruit of *Yatay* in another cut in his article. Up to this time the Acorn Butia had received no tenable name.

In 1881 Dr. Blumenau reported two palms that had been introduced into Germany from Santa Catharina and Rio Grande do Sul in southern Brazil, one of which is held to be identical with *Bonneti*. These plants were *Cocos Blumenavia* and *C. Gaertneri*, discussed in Die Gartenflora by Dr. Blumenau. The two palms were considered to be distinct, and differences were drawn between them. In the following year in Die Gartenflora *C. Blumenavia* was supposed to be either *C. capitata* or *C. eriospatha;* and in Revue Horticole in 1910 Chabaud says that Drude, author of the palms in Flora Brasiliensis, had identified it as *C. eriospatha*. There could hardly be any doubt in the reference of a palm to a species so well marked as *eriospatha*. Imperfect specimens of my own, from a tree in southern California, however, grown as *C. Blumenavia* from European seed are apparently not *C. eriospatha*. Dr. Blumenau's long residence in southern Brazil must have given him opportunity to observe these palms at first hand; it is to be hoped that something in the way of old specimens or of living trees under glass may yet be found to aid in solving the problem.

The Gartenflora accounts in 1881 and 1882 present more or less basis for the establishment of a specific name whereas the entries under *C. Bonneti* do not. The German account in 1882 thinks *C. Gaertneri* (of which there is a picture of a plant in a tub) is *C. leiospatha* var. *angustifolia* of Drude, and this is confirmed by the statement of Chabaud in 1910. The fruit of *C. leiospatha*, however, as shown by Barbosa and Drude, is quite unlike that of the plant we have known as *Gaertneri* and *Bonneti*, and Beccari (as we have seen on page 41) puts a question mark after the reference of it to var. *angustifolia*.

Neither the French nor the German accounts can properly form the basis of dependable nomenclature. Of the two names, *Cocos Bonneti* and *C. Gaertneri*, the latter has the better standing; it might be transferred to

the genus Butia as, in fact, was done in Florida by the late Henry Nehrling, but here, again, his use of the new combination in a local newspaper (American Eagle, Estero, Sept. 5, 1929) does not constitute nomenclatorial publication.

Under all these dubious circumstances I prefer to leave the nomenclature as Beccari left it, without citing his literary references: as both *C. Bonneti* and *C. Gaertneri* are *nomina nuda* or at least *nomina perdubia* they have no standing in nomenclature and his subsequent use of either one of them is not prohibited by the homonym rule. In handling this problem, Beccari has practically made a new species of Butia, first technically described in his paper.

3. **Butia leiospatha,** Becc. (*lejospatha*) in Agric. Coloniale, x, 520 (1916); reprint, p. 70. Fig. 20.

Cocos leiospatha, Barb.-Rodr. in Revista de Horticultura, ii, p. 24 fig. (1877, Rio de Janeiro); Protesto-Appendice, Enum. Palm. Nov., 44 fig. (1879); Sertum Palm. Bras. i, 81 (1903), t. 61A, and t. 62B (*laeospatha*); *B. leiospatha*, Becc. l. c. 494 (note), reprint, p. 43.

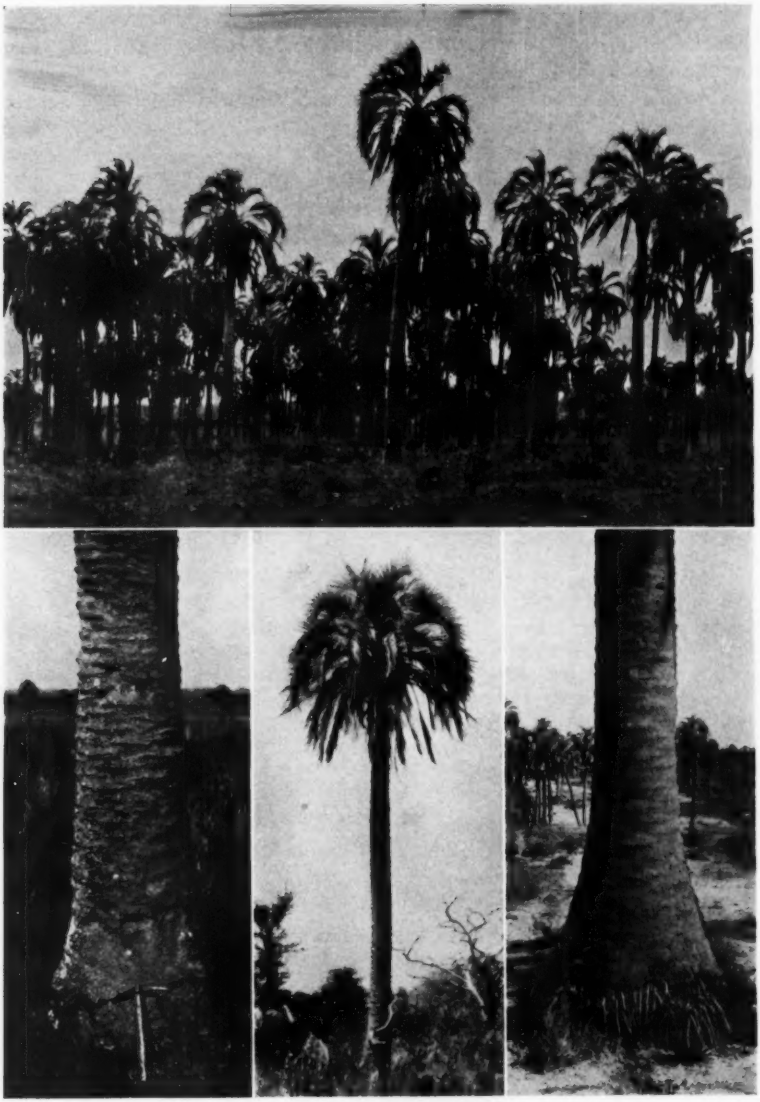
Cocos capitata var. *leiospatha*, Berger, in Hortus Mortolensis, 87 (1912).

Small low palm with caudex to 1 m. tall and ¼ m. thick, or rarely to 2 m. high, naked below but with a capital of persistent petiole bases and condensed crown: leaves 1 m. or so long, glaucous; pinnæ 25-30 pairs, equally placed on rachis, the middle ones about 3 dm. long and to 15 mm. broad, apex only minutely bilobed: minor spathe-valve linear-lanceolate, to 20 cm. long, rusty-tomentose; major spathe-valve acuminate-mucronate, 50 cm. long, glabrous (as the name *leiospatha* indicates): spadix 50 cm. or less long, the flowers few on short branches: fruit elliptic, about 20 mm. long and 12 mm. thick, sides nearly straight, short-pointed, greenish-yellow at maturity with lilac apex, the cupule with pointed parts extending one-third the length.

Brazil, State of Minas Geraes, Barbosa; State of Parana, E. Jonsson 985a as determined by P. Dusén.

Palm not clearly differentiated and doubtful whether in cultivaation in North America although Beccari knew a few planted palms in Europe that he referred more or less confidently to it. Nehrling thought he had it as the following sentences from the American Eagle, 1929, explain: "*Butia leiospatha* came also from southern Brazil, but I have lost the name of the collector. The fruits are small and valueless (except as chicken-feed)." Unfortunately we do not have specimens of North American cultivated plants supposed to represent this species.

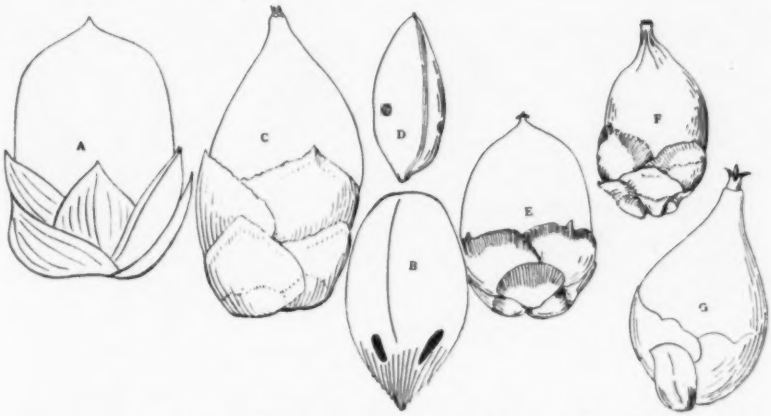
Knowledge of this species is contained in the writings of Barbosa cited above and the account of Drude in Flora Brasiliensis. The species was not



21. TREES OF YATAY in the wild in Argentina.—*Butia Yatay.*

growing in Jardim Botanico, Rio de Janeiro, when I made a careful study of the plantings there for the primary purpose of identifying the Barbosan palms. Beccari suggests that *B. leiospatha* may be one of the many forms of *B. capitata*, a reference with which I am in sympathy.

It is distinguished from *B. capitata* by the smaller dimensions, fewer and shorter pinnæ, small spathe and spadix, and by the narrow drupe as illustrated by both Barbosa and Drude (Sertum Palm. Bras., i, t. 62B; Fl. Bras. t. 96). Drude's picture shows petiolar spines or teeth to be many, very small and close together and not pointed.



22. FRUITS OF YATAY, a little more than natural size. A, B, from Martius in Palmetum Orbignianum. C, D, E, F, as grown in Florida, E and F immature. G, *B. paraguayensis* from Barbosa.

Drude's *C. leiospatha* var. *angustifolia* (Fl. Bras. iii, II, 423, t. 96, 11) Beccari refers questionably to *Butia Bonneti*. (p. 38)

4. **Butia Yatay,** Becc. in Agric. Coloniale, x, 498, t. v fig. 6, t. vi (1916); reprint, p. 48. YATAY. ARGENTINIAN BUTIA. Figs. 21, 22, 23.

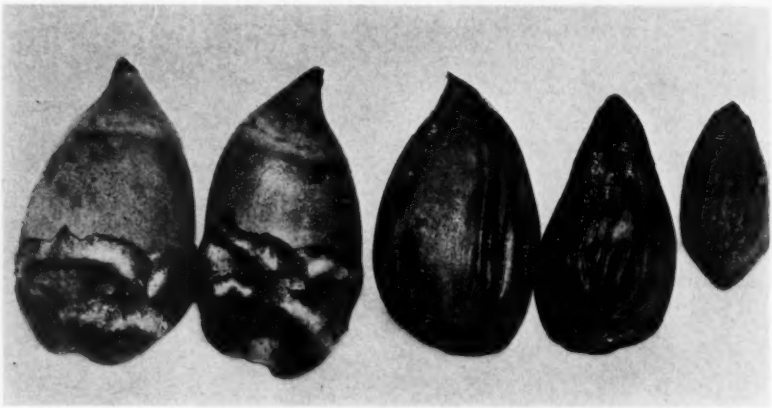
Cocos Yatay, Martius, in Palmetum Orbignianum, 93 (1839+); Hist. Nat. Palm. iii, 289, 324 (1845).

Cocos Yatai, Martius, in Palmetum Orbignianum, t. i fig. 1 and t. 30 fig. B.

Cocos Jatay, Barb.-Rodr. in Contrib. Jard. Bot. Rio, i, 36 (1901).

Cocos eriospatha, A. M. Lindman (non Martius) in Beitr. zur Palmenflora Südamerika, t. 1A (Bilhang till Kongl. Svenska Vetenskaps-Akademiens Handlinger, xxvi, no. 5, Stockholm 1900).

Stout palm with trunk to 8 m. (25 feet), eventually bare and roughly ringed but capital of old petiole-bases remaining under the crown: leaves to 3 m. long, strongly outwardly arching and the lower ones on old trees nearly hanging, making a dense head or crown; basal end of petiole usually bearing much broad fringed paper-like shag; pinnæ 50 or 60 or more, equally spaced on the rachis, rigid or stiff, 2½ cm. or less broad, upper and lower ones on the rachis usually very narrow, more or less glaucous- or bluish-green, the apex usually prominently bilobed with rather broad or not filamentose or spreading tips: major spathe mostly attaining nearly or quite 1 m. in length and sometimes more, lignose; spadix simply branched:



23. FRUITS AND A NUTLET OF YATAY grown in southern Florida; natural size. *Butia Yatay*.—At left, two fruits picked from the tree with cupule intact; fruits 45 mm. long, 26 and 25 mm. thick at broadest place (about 1¾ in. long and 1 in. broad). In center, two fruits from the ground under the tree beginning to shrivel and cupule absent; 43 and 40 mm. long. Right, a nutlet containing seed; 29 mm. long and 14 mm. broad.

flowers large, the pistillate 15 mm. long, ochroleucous, the branches markedly undulate and angled: fruit very large, 35 mm. or more long and 20 mm. broad, acuminate into a gradual and prominent point or beak (at least when dried), the cupule large and with acuminate outer parts and extending one-third or more length of drupe which is deep or dark yellow to orange and often suffused with dull red, the flesh ample and edible; nutlet narrow-oblong, 30 mm. or more long, narrowed either way but more acuminate to the basal or poral end.

Described as forming great forests on the sandy areas of Provinces Corrientes and Entre Rios in Argentina. Fig. 21 shows this palm in Entre Rios, photographed, collected and determined for me by Sr. Alberto Castellanos of the Museo Nacional de Historia Natural, Buenos Aires; dried drupes, without cupule, 35 mm. long and strongly taper-pointed; base of petiole with sheath-like web 10 cm. broad; lower petiolar spines 25 mm. long; spathe upwards of 125 cm. long; branching part of spadix 76 cm. long.

Portrait of a tree of *Cocos Yatay* in the original publication of the species (Martius Palmetum Orbignianum, t. 1) is very different from the trees shown in Fig. 21, representing, as it does, a plant with an inclined somewhat narrowed base to the trunk. This feature looks to be unnatural, in the portrait, which was made long before the days of photographic accuracy; and, moreover, the original text gives no support to the drawing. It was perhaps a burned tree.

24. Tree of Butia eriospatha in Wright garden, Riverside, California.

Martius states that the palm is known to the Gaurani Indians as "Yataï," and the name was adopted by the Spaniards. Barbosa writes in his Contributions du Jardin Botanique de Rio de Janeiro, volume i, page 37, that the vernacular name Jatà-y is applied to several Cocos palms and even to Diplothemium; in the Gaurani it means a "small hard fruit."

5. **Butia eriospatha,** Becc. in Agric. Coloniale, x, 496 (1916); reprint, p. 46. WOOLLY BUTIA. Figs. 24, 25, 26, 27.

Cocos eriospatha, Martius ex Drude, in Martius, Fl. Bras. iii, II, 424 (1882).

Cocos Blumenavia, Hort.; Blumenau, in Gartenfl. xxx, 103 (1881) apud Drude ex Chabaud in Rev. Hort. 1910, 200.

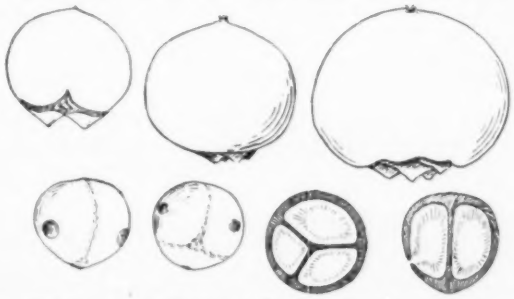
Tree having caudex to 5 or 6 m. and which becomes bare, old petiole bases forming a capital under the crown: leaves ascending and then sharply curving downward in the upper third in hook-like form, glaucous- or bluish-green, main blades 1 m. or more long; pinnæ 50 or more pairs regularly placed singly on rachis, middle ones 16 mm. or so broad in center, tapering to long narrow end which is at first cut into 2 narrow filament-like lobes about 3 cm. or more deep; rachis rounded beneath and narrowly keeled above; petiole to 75 cm. long, usually very shaggy at base and bearing relatively weak rather small teeth or spines 15-21 mm. long: major spathe-valve 75-135 cm. long and up to 16 cm. broad, rather abruptly narrowed to a blunt point, conspicuously but variably brown-woolly, the wool sometimes persisting over winter but often nearly vanished by the end of the first year (even when the spathe has become practically nude it has a roughish ridgy look quite unlike the surface of the smooth species): spadix about 1 m. long or less, densely branched, glabrous or rarely one of the axes carrying brownish tomentum: staminate flower-buds at maturity narrow and irregular, about 5 mm. long when dried, com-

25. THREE BIFID TIPS of the pinnæ of *Butia eriospatha;* at H a tip of *B. capitata,* although it is not always as entire as the picture shows. At right a deflorated axis or rachilla of *B. eriospatha* to show the prominent persistent points.

monly very lightly nerved although there is variation in this regard; pistillate flowers at anthesis period 7-9 mm. long and very broad, flowers and rachis sometimes pinkish but usually ochroleucous: fruit yellow, depressed, 16-20 mm. high to the short point or umbo and 1 or 2 mm. broader but sometimes running to forms as much as 26 mm. broad, the cupule very small and usually hidden underneath the drupe with the broad parts only short-acute; nutlet 1- or 2-seeded, short-oblong or subconic and sometimes oblong with somewhat narrowed ends, about 15 mm. long and 10 mm. broad, pores mostly obscure.

Native in fields in the States Rio Grande do Sul and Santa Catharina, southernmost Brazil and reported by Barbosa in the State São Paulo where the trunk attains a diameter of more than one-half meter.

To this species Barbosa refers *Cocos Blumenavia*, which name in that case would replace *eriospatha*, being one year older (1881). Beccari refers that name here with a question mark. The horticultural account by Dr. Blumenau in Gartenflora, xxx, 103 (1881) and an anonymous one in xxxi, 244 (1882) are not sufficient, however, to establish identity: see page 38.



26. Fruits and nutlets of *Butia eriospatha*, natural size. Upper left, one fruit copied from Barbosa; other two top are larger forms grown in California and Florida. Bottom row, views of a three-seeded nutlet, the last one showing the micropylar orifice.

The woolly Butia is frequently planted in the southern United States. It makes a handsome graceful tree with its narrow pinnæ and the prominent downward rounded curve of the upper leaf-ends.

The only other Butia described with brown-tomentose major spathe is *B. microspadix* (page 47) although *B. amadelpha* is puberulent or pubescent.

II. The Minor Butias, not known to be in cultivation, at least in the United States (p. 25).

Species little understood and incompletely described, not capable yet of being effectively keyed; added here to complete the account of the genus.

In his Cocos paper of 1916 Beccari mentioned *C. amadelpha*, *C. Wildemaniana*, *C. arenicola* as probably belonging to Butia; subsequently the transfers have been made by Burret.

Butia amadelpha, Burret, in Notizblatt Bot. Gart. u. Mus. Berlin-Dahlem, x, 1050 (1930).

Cocos amadelpha, Barb.-Rodr. Palm. Hasslerianæ, Nov. 7 (1900).

Acaulescent: leaves arched; pinnæ very narrow linear, obliquely bidentate at apex, middle ones about ½ m. long: main spathe lanceolate and involute, to 40 cm. long, gray-pulverulent on outside: spadix 30-40 cm. long, shorter than the leaves: staminate flowers with broad-oblong acuminate rostrate petals, ovary tomentose.

Paraguay.

Butia arenicola, Burret, l. c. 1051.

Cocos arenicola, Barb.-Rodr. l. c. 9: Sertum Palm. Bras. i, 100, t. 75B (1903).

Acaulescent: leaves recurved, regularly pinnate, 1½ m. or more long; pinnæ opposite and linear-lanceolate, acuminate, the middle ones about ⅓ m. long: main spathe ½ m. long, narrow, long-vaginate, short-mucronate, smooth: spadix nearly ½ m. long on a long peduncle, bearing 20-25 short branches.

Paraguay.

The latest disposition of these two palms is *Syagrus amadelpha* and *S. arenicola*, Frambach in Dahlgren Index of American Palms, Field Museum of Natural History, Botanical Series, xiv, 264 (1936).

27. FRUITS OF BUTIA ERIOSPATHA, about natural size, grown in Florida.

Butia microspadix, Burret, l. c. 1050.

Small palm, perhaps acaulescent: leaves small and recurved, petiole and rachis tawny-scaly or tomentose; pinnæ narrowly linear, regularly placed, mostly opposite on the rachis, to 37 cm. or less long and 7 mm. broad, narrowly acuminate and bifid: spathe small, on the outside densely fusco-tomentose: spadix rachis about 6 cm. long, the small branches about 25 of which the larger are about 8 cm. long: pistillate flowers small, subglobose-ovate; staminate about 10 mm. long, oblong, acute, the petals densely punctulate on the outside.

Brazil, probably State of São Paulo.

† **Butia paraguayensis,** stat. nov.

Cocos paraguayensis, Barb.-Rodr. Palm. Nov. Paraguayenses, 9, t. ii (1899); Palm. Hasslerianæ, 12 (1900); Sertum Palm. Bras. i, 110, t. 82 (1903).

Butia Yatay var. *paraguayenis*, Becc. in Agric. Coloniale, x, 503 (1916); reprint, p. 53.

Smaller palm than *B. Yatay*, mostly without definite trunk, with all the parts on a lesser scale, pinnæ 13 mm. or less broad: drupe ovoid-attenuate, cherry-like, about 30 mm. long and 20-23 mm. thick, yellow, the deep cupule with only short points or the rim nearly obtuse.

Native in Paraguay, at San Salvador.

This is the only botanical species of Butia that was definitely contrasted by its author with another species. Barbosa in his Palmæ Novæ Paraguayenses makes the following comparisons, the first column representing *Yatay* and the right-hand column *paraguayensis:*

Trunk tall, 4-5 m. tall, more than than 1 ft. diam.	Acaulescent, rarely 1-2 m., 6 cm. or less diam.
Leaves 2-3 m. long.	Leaves 1.6-1.8 m. long.
Spadices 1.5 m. long.	Spadices ¾ m. or less long.
Peduncle 7 dm. long.	Peduncle about 4 dm.
Branches of spadix 150-200 and 3-4 dm. long.	Branches 25-30 and less than 1. dm.
Pistillate flowers 8-10 mm. long.	Pistillate flowers one-fourth or one-fifth as long.

I do not know a plant in cultivation that I would now refer to var. *paraguayensis*. Such plants as I have heretofore referred there are only small-fruited forms of trees as big as *B. Yatay* itself and with broad pinnæ, the dried drupes being 22-30 mm. long. Beccari refers to this variety plants grown in two gardens in southern France.

Whether this small-fruited Yatay in Texas and California deserves a varietal name (as I once thought) cannot be answered until we understand the species better and particularly the technical differences between *B.*

Yatay and *B. capitata*. The contrasts between these species must be worked out with trees growing in the wild in their native places, not alone from subjects in cultivation. Beccari remarks he has not discovered characters that enable him to separate juvenile plants of the two species *Yatay* and *capitata*.

Beccari states that *paraguayensis* is only a slender small-fruited form of *B. Yatay*, but I am not convinced of this disposition from Barbosa's description of it; nor am I certain that Beccari's fruits of this palm in his plate vii B are the same as the picture by Barbosa in his New Palms of Paraguay (Fig. 22, G herewith).

Butia Poni, Burret, in Notizblatt Bot. Gart. u. Mus. Berlin-Dahlem, x, 1051 (1930).

Cocos poni, Hauman, in Physis, iv, 604, figs. (Buenos Aires, 1918).

Practically undescribed, but the two small pictures by Lucien Hauman show a little practically acaulescent plant about 1 m. high, with small spreading-arching leaves of perhaps 25 pairs of narrow pinnæ, very short and small spathe and spadix, the half dozen or so ovate-pointed fruits in a head-like cluster on a long peduncle; spathe pointed; branches of spadix about 30. He states that it differs from *C. Yatay* in its dwarfness, foliage and inflorescence much smaller.

Argentina. Known as El yatay poñi.

Butia pungens, Becc. in Agric. Coloniale, x, 523 (1916); reprint, p. 73.

Small palm with numerous glaucous very coriaceous and rigid pinnæ produced into a pungent apex even though bidentate or bifid and that are nearly equally placed on the rachis, the main ones to 35 cm. long to 12 mm. broad: major spathe coriaceous and very rigid, acuminate, glaucescent and smooth: spadix rigid, about 60 cm. long: pistillate flowers ovate-conic, 13-15 mm. long and 9 mm. broad.

Argentina.

Butia stolonifera, Becc. l.c. 492 (1916); reprint, p. 42.

Cocos stolonifera, Barb.-Rodr. in Contrib. Jard. Bot. Rio, i, 4, t. iv A. (1901); Sertum Palm. Bras. i, 89, t. 62A (1903).

Acaulescent and cespitose with long subterranean stolons that send up new plants: leaves slender, erect or nearly so, to 1 m. and more long, 5-7 borne at one place, petiole to 50 cm. long and bearing very short spines; pinnæ alternate on the rachis, very long-acuminate, apex bifid, glaucous underneath, to 50 cm. long; spadix, flowers, fruits not described by Barbosa.

Uruguay in Pan d'Azucar near Montevideo.

Butia Wildemaniana, Burret, l.c. 1050.

Cocos Wildemaniana, Barb.-Rodr. in Palm. Hasslerianæ, Nov. 9 (1900); Sertum Palm. Bras. i, 101, t. 75A (1903).

Acaulescent, the caudex being short and subterranean: leaves arching, glaucous-green, to 1 m. long; pinnæ regularly opposite, linear-lanceolate, very long-acuminate, about 40 cm. long: spathe about 50 cm. long, narrow, pointed, smooth: spadix with 15-20 short branches: pistillate flowers conic; staminate smaller, with linear-lanceolate acuminate petals.

Paraguay. Dedicated to Dr. E. de Wildeman, of the Botanic Garden, Brussels, Belgium.

This species is recently made *Syagrus Wildemaniana*, Frambach, in Dahlgren, Index of American Palms, 270 (1936).

Arecastrum-Butia Hybrids

Two records of supposed hybrids between Arecastrum and Butia are in the scientific systematic literature. One is by Barbosa-Rodrigues, describing a wild occurrence in Uruguay in his Sertum Palmarum Brasiliensium, volume 1, page 116 and a figure of fruit, in 1903. The other is by Beccari describing a tree in cultivation in northern Italy in his Cocos paper of 1916, pages 462-464, reprint 30-32. These records are surprisingly few in two closely related genera that are native in the same territory and are so commonly planted contiguously in many parts of the world.

The Barbosa assumed hybrid is supposed to have come from a Butia fecundated by an Arecastrum. The petioles are dentate, as in those of the former, and the foliage is like Arecastrum; fruit imperfectly 3-celled, in shape like that of a narrow Butia. The trunk was described as 3-4 meters high, and like that of Arecastrum. Barbosa names this tree *Cocos Romanzoffiano-pulposa*, which in Beccarian nomenclature becomes *Arecastrum Romanzoffianum* × *Butia capitata* var. *pulposa*.

The Beccari plant from the Mortola gardens "has the trunk and insertions of the leaves like Butia; the petioles, however, are not spiny; the segments are placed exactly as in Butia, are finely coriaceous, green on both surfaces, shiny above, not powdery-waxy underneath but slightly more pale than the upper surface, midrib very pronounced and yellow, closely bunched together on the upper two-thirds of the rachis." One spathe was 1.5 meters long and another 1.8 meters; one spadix 1.3 meters; spathe plicate-sulcate and like the larger forms of *Arecastrum Romanzoffianum;* male flowers like those of Arecastrum, but female flowers identical with those of Butia. Beccari adds that "the species of Butia that could have contributed to the formation of this hybrid is in all probability *B. capitata* or one of its varieties."

Growing at the Royal Palm Nurseries, Oneco, Florida, is an assumed hybrid with a more definite history. It is now a tree of flowering age. It was grown from a Butia seed, yet it is not a Butia. From Butia it differs in slender trunk, in foliage, petiole margins, sulcate spathe. I have not seen

flowers or fruits; if these come to hand later I may make a subsequent report.

The tree is one of a number of seedlings of a plant grown as *Cocos Gaertneri* which stood under a blooming tree of *Cocos plumosa*, that is, probably what was *Butia capitata* by *Arecastrum Romanzoffianum*. It has never produced fertile seed. It is fifteen to eighteen years old.

The tree has the general dimensions of a Butia at early bearing age. The trunk is relatively slender, with petiole bases still adhering: leaves large, in the specimen before me with petiole 1.4 m. long and blade 3 m. long, bearing 117 pinnæ either side the rachis and which (except at the base) are closely evenly spaced and subopposite; pinnæ with general habit of Arecastrum but showing little tendency to the knuckled bend midway, not as stiff as in Butia, bright green and not glaucous, glabrous except a line of fluff on midrib underneath, the largest ones 1 m. long and 3½ to about 4 cm. broad, apices variously bifid; petiole very heavy, 10 cm. broad at base, margins coarsely shreddy for the first 60 or 70 cm. and then bearing a few weak or short teeth or prongs the longest of which may be about 2 cm. long and slender, lacking the well-armed character of Butia; rachis in main part of blade produced on upper side into a thin knife-like ridge much as in Arecastrum: outer or primary spathe to 60 cm. long; inner or main spathe large and woody, strongly sulcate on both surfaces, long-pointed, 1.7 m. long and 26 cm. broad at widest place: spadix or inflorescence 1.6 m. long and bearing many sinuous glabrous rachillæ to 70 cm. long.